

Rapid Ecological Assessment for Driftless Area Study Streams

A Rapid Ecological Assessment Focusing on Rare Plants, Selected Rare Animals, and High-quality Natural Communities



Properties included in this report are listed on the next two pages

Wisconsin's Natural Heritage Inventory Program
Bureau of Endangered Resources
Department of Natural Resources
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Properties included in this report, grouped by county:

Chippewa

- Elk Creek Fishery Area
- Sand Creek Fishery Area

Crawford

- Gordon's Bay Landing Public Access
- La Crosse Area Comprehensive Fishery Area
- Statewide Public Access
- Stream Bank Protection Fee Program
- Rush Creek SNA (FM-owned parcels)

Dane

- Black Earth Creek Fishery Area
- Mount Vernon Creek Fishery Area
- REM-Elvers Creek
- Stream Bank Protection Fee Program

Dunn

- Bolen Creek Fishery Area
- Lake Menomin Fishery Area
- REM-Elk Creek
- REM-Gilbert Creek
- REM-Otter Creek
- REM-Tainter Lake Spawning Marsh
- REM-Wilson Creek

Eau Claire

- REM-Clear Creek
- Statewide Habitat Areas
- Stream Bank Protection Fee Program

Grant

- Mount Hope Rearing Station
- REM-Big Green River
- REM-Blue River
- REM-Castle Rock Creek
- REM-Little Platte River
- Snow Bottom SNA

Iowa

- REM-Big Spring Creek
- REM-Conley Smith Creek
- REM-Love Creek
- REM-Pompey Pillar Creek
- Statewide Habitat Areas
- Stream Bank Protection Fee Program
- Trout Creek Fishery Area

Jackson

- Albion Rearing Station
- Beaver Creek Rearing Station
- Buffalo River Fishery Area
- Buffalo River Trail Prairies SNA
- Half Moon Bottoms SNA
- Half Moon Lake Fishery Area/Statewide Habitat Areas
- Halls (Stockwell) Creek Fishery Area
- North Branch Trempealeau River Fishery Area
- REM-So Branch Trempealeau River
- REM-Washington Coulee
- Sand Creek Streambank Protection Area
- Smith Pond Fishery Area
- Stream Bank Protection Fee Program
- Tank Creek Fishery Area
- Trump Coulee Rearing Station

La Crosse

- Statewide Habitat Areas
- Coon Creek Fishery Area
- La Crosse Area Comprehensive Fishery Area

Monroe

- Big Creek Fishery Area
- Coon Creek Fishery Area
- Eureka Maple Woods SNA
- La Crosse Area Comprehensive Fishery Area
- La Crosse River Fishery Area
- Pinnacle Rock Rearing Station
- Portland Maples SNA
- REM-Rathbone Creek
- Sand Creek Pines SNA
- Sand Creek Streambank Protection Area

Pierce

- Rush River Delta SNA
- Statewide Habitat Areas

Continued on next page

Richland

- Bear Creek Fishery Area
- Pine River System Fishery Area
- REM-Ash Creek
- REM-Camp Creek
- REM-Elk Creek
- REM-Hansell Creek
- REM-Knapp Creek
- REM-Milancthon Creek
- REM-Mill Creek
- REM-Pine River
- Sabin Springs Fishery Area
- Statewide Public Access
- Willow Creek Fishery Area

Sauk

- Bear Creek Fishery Area
- Bear Creek Sedge Meadow SNA
- Hulbert Creek Fishery Area
- Hulbert Creek Woods SNA
- REM-Baraboo River
- Statewide Habitat Areas

Trempealeau

- Buffalo River Fishery Area
- Buffalo River Trail Prairies SNA
- REM-Buffalo River
- REM-Pine Creek
- Trempealeau Lakes Fishery Area

Vernon

- Coon Creek Fishery Area
- La Crosse Area Comprehensive Fishery Area
- REM-Bishop Branch Creek
- REM-Maple Dale Creek
- REM-Rainbow Springs
- REM-West Fork Kickapoo River
- Statewide Habitat Areas

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Cover Photos:

Top four pictures depicting natural communities:

- Upper left: Pine Relict and Dry Cliff at Snow Bottom SNA, by Ryan O'Connor
- Upper right: Floodplain Forest at Rush River Delta SNA, by Richard Staffen
- Lower left: Southern Mesic Forest at Tainter Creek Fishery Area, by Ryan O'Connor
- Lower right: Bear Creek Fishery Area, WDNR staff.

Lower line of pictures depicting plants and animals, left to right:

- Giant water-leaf (*Hydrophyllum appendiculatum*) at Eureka Maple Woods SNA, by Ryan O'Connor
- Gophersnake (*Pituophis catenifer*), by U.S. Fish and Wildlife Service
- Cerulean warbler (*Dendroica cerulea*), by Dennis Malueg
- Broad-banded forest snail (*Allogona profunda*), by Armund Bartz
- Pickerel frog (*Lithobates palustris*) at Big Spring, by Richard Staffen
- Northern wild monkshood (*Aconitum novaboracense*), by Darcy Kind

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Driftless Area Study Streams at a Glance

Exceptional Characteristics and Opportunities of the Study Area

- **Rare Animals and Plants.** Driftless Area Study Streams properties support numerous rare species. Ninety-seven rare animal species have been documented at Driftless Area Study Streams, including 12 State Endangered species, 26 State Threatened species, 59 Special Concern species, and three associated rare animal assemblages. Forty-six rare plant species are also known from Driftless Area Study Streams, including six State Endangered, 14 State Threatened and 26 Special Concern species.
- **Forest Interior Bird Conservation.** The larger Driftless Area region (including southeast Minnesota and northeast Iowa) represents one of the best opportunities in the upper Midwest for forest interior bird habitat management, particularly for species that depend on southern forest types (Wilson, 2008). Forest interior birds have suffered severe population declines in Wisconsin and throughout their range due to habitat loss. Twelve forest interior bird species were identified as breeding on WDNR Driftless Area Study Streams properties.
- **Oak Savanna Restoration.** Oak savannas were historically common in Wisconsin but are now rare throughout the state, thus their restoration is critical to the survival of many rare plants and animals that depend on them. Abundant opportunities exist on Driftless Area Study Streams properties to restore Oak Opening, Oak Woodland, and Oak Barrens on a landscape scale and within a matrix of other habitats.
- **Coulees, Gorges, Cliffs, and Slopes.** The Driftless Area's deeply dissected landscape includes coulees, gorges, cliffs, and shaded north-facing slopes that produce exceptionally cool and protected environments. These habitats often support relict communities in which northern species are prominent. Many Midwestern endemics and habitat specialists with limited distribution occur in these settings. Natural communities in the study area that are associated with these unique habitats include Southern Mesic Forest, Pine Relict, Dry Cliff, Moist Cliff, and Algific Talus Slope.
- **Cold- and Cool-Water Streams, Springs, Spring Seeps, and Riparian Wetlands.** The porous sandstones of the Driftless Area retain large amounts of water, which are released at thousands of locations throughout the region via springs and spring seeps. The extensive network of cool-water streams within Driftless Area Study Streams properties support significant populations of pollution-intolerant invertebrates, rare nongame fish, and native brook trout.
- **Terrestrial/Land Snail Conservation.** Land snails, in general, have a slow rate of dispersal; without suitable habitat or dispersal corridors, they can not expand as viable populations. Few intact habitats remain that will support the rarer native snail populations. Driftless Area Study Streams properties have abundant snail habitat in the form of cliffs, rock outcrops, dry prairies/savannas, and mesic forests. Six rare snail species are known in the study area.
- **Herptile Conservation.** The Driftless Area offers one of the best opportunities in the state for herptile conservation. Driftless Area Study Streams properties provide diverse habitats suitable to herptiles, including prairies, barrens, oak savannas, aquatic resources, fractured limestone outcrops, and wetlands. Seven rare reptile and two rare amphibian species were detected on study area properties, in addition to numerous snake hibernacula.

Continued on next page...

Driftless Area Study Streams at a Glance (continued)

Exceptional Characteristics and Opportunities of the Study Area (continued)

- **Small Mammal Conservation.** Many native small mammals have declined both in range and abundance in the past 100 years due to habitat degradation and destruction (Stephens 2011). The extensive prairie/grassland and oak savanna habitats on Driftless Area Study Streams properties provide a significant opportunity for small mammal conservation. One rare upland mouse species was detected on several study area properties, and a rare shrew was detected unexpectedly on two properties, outside of this species' previously known range.
- **Bat Conservation.** Opportunities to promote bat habitat at Driftless Area Study Streams properties include providing resources for roosting, foraging, and drinking. While no hibernacula were identified on Driftless Area Study Streams properties, surveys detected all seven bat species known to summer in Wisconsin, including three that are State Threatened.

Site Specific Opportunities for Biodiversity Conservation

Seventeen ecologically important sites were identified in the Driftless Area Study Streams study area (listed below). These “Primary Sites” were delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. Complete descriptions and maps for each of the Primary Sites can be found in Appendix G.

DAS01	Copper Creek
DAS02	Half Moon Bottoms Floodplain Forest
DAS03	Eureka Maple Woods & Portland Maples SNA
DAS04	Bear Creek Wetlands
DAS05	Coon Creek Cliffs SNA
DAS06	Sand Creek Pines and Barrens
DAS07	LaCrosse River Pine-Oak Barrens
DAS08	Rush Creek Coulees and Ridges
DAS09	Snow Bottom SNA
DAS10	Trout Creek Uplands
DAS11	Pinnacle Rock Rearing Station
DAS12	Milancthon Creek
DAS13	Big Spring Creek
DAS14	Tainter Creek
DAS15	Rush River Delta SNA
DAS16	Hulburt Creek Woods SNA
DAS17	Buffalo River Trail Prairies SNA

Introduction

Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for fee-title Wisconsin DNR Fisheries Management properties within the Driftless Area (herein “Driftless Area Study Streams” Figure 1¹). The regional ecological context for Driftless Area Streams is also provided to assist in developing the Regional and Property Analysis that is part of the master plan. There are other properties in addition to the Driftless Area Study Streams that will be included in the master planning process that are not addressed in this report.

Important information regarding State Natural Areas (SNA): There are instances where State Natural Areas consist of a mix of WDNR ownerships. For example, most parcels within Rush Creek SNA are owned and managed by the Bureau of Endangered Resources, but several are owned and managed by the Bureau of Fisheries. In situations like this, information pertaining only to the fisheries-owned parcels is provided in this main report and in Appendix C, D and E (rare species and natural communities found on Driftless Area Study Streams properties). In Appendix G and H, however, information on the Primary Sites covers all SNA parcels, regardless of WDNR ownership. In addition, Appendix I provides descriptions of SNAs that have no fisheries-owned parcels, but fall within the Driftless Area and are associated with streams; these sites are logical inclusions for this master planning initiative.

The primary objectives of this project were to collect biological inventory information relevant to the development of a master plan for Driftless Area Study Streams, and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of documented or potential habitat for rare species and identifying natural community management opportunities.

Survey efforts for Driftless Area Study Streams were limited to a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning, although inventory efforts were reduced compared to similar projects conducted on much larger properties such as state forests. There will undoubtedly be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work.

Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR’s Bureau of Endangered Resources and a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see www.NatureServe.org for more information), coordinates the network.

Natural heritage programs track certain elements of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The NHI Working List

¹ Please note that the three Zones delimited in all report maps are arbitrary, and were created for convenient frames of reference for the report.

contains the elements tracked in Wisconsin. They include endangered, threatened, and special concern plants and animals, as well as the natural community types recognized by NHI. The NHI Working List is periodically updated to reflect new information about the rarity and distribution of the state's plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR website (*Wisconsin Natural Heritage Working List*).

The Wisconsin NHI program uses standard methods for biotic inventory to support master planning (Appendix A). Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for Driftless Area Study Streams were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureau of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but include some surveys for rare plants and animals, and 2) taxa-specific surveys.

The most recent taxa-specific field surveys for the study area were conducted during 2010-11 (Table 1). NHI surveys were limited in scope and focused primarily on documenting high quality terrestrial natural communities (including those in riparian corridors), and the rare plants, breeding birds, herptiles, bats, small mammals, terrestrial snails, and other terrestrial insects that occupy these habitats. While WDNR Fisheries staff will analyze fish surveys (including fish index of biotic integrity numbers) as part of the master planning process, NHI did conduct surveys of aquatic invertebrates and mussels for the Driftless Area Study Streams project. The collective results from all of the above surveys were used, along with other information, to identify ecologically important areas, or "Primary Sites," in the Driftless Area Study Streams study area. All 174 Driftless Area Study Streams received a preliminary review using NHI data, Digital Orthophotos, and Department biologist input.

Private lands (including DNR owned easements) surrounding Driftless Area Streams properties were not surveyed. However, some Streambank protection program properties that are within or adjacent to a DNR owned property were surveyed. The Stream Bank Protection Program (SBP) was established in 1990 as a supplement to the traditional Fisheries Areas Program, with the goals to protect and restore corridors along cool and coldwater streams, to improve water quality, and to provide public access. The SBP program purchases easements directly from landowners to manage fish habitat and angling access on selected exceptional waterways identified under the program.

During a preliminary screening process, survey locations were identified by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the Driftless Area Study Streams study area, key inventory considerations included the identification of: high quality prairies, wetlands, barrens, savannas, pine relicts, upland forests, and cliffs, as well as the location of habitats that had the potential to support rare species. Private lands (including easements) surrounding Driftless Area Study Streams properties were not surveyed.

Within this report, scientific names have been used with first mention of species, thereafter the common name has been used. A list of all scientific names mentioned in the text is included at the end of this document.

Table 1. Driftless Area Study Streams NHI Field Surveys (2010-2012)

Properties with no survey dates were identified as lacking appropriate conditions for high-quality natural communities or important native plant/animal habitat during preliminary screening process.

Driftless Area Study Stream (county)	Natural Communities	Plants	Breeding Bird Surveys	Herpetiles	Bats	Small Mammals	Aquatic Invertebrates	Terrestrial Snails	Terrestrial Insects
Albion Rearing Station (Jackson)									
Bear Creek Fishery Area (Richland, Sauk)		2010	2010		2011				2011
Bear Creek Sedge Meadow SNA (Sauk)		2010	2010						
Beaver Creek Rearing Station (Jackson)	2010		2010	2010	2011	2011	2011	2011	2011
Big Creek Fishery Area (Monroe)						2011		2011	2011
Black Earth Creek Fishery Area (Dane)									
Bolen Creek Fishery Area (Dunn)									
Buffalo River Fishery Area (Jackson, Trempealeau)	2010	2010	2010		2011	2011	2011	2011	
Buffalo River Trail Prairies SNA (Jackson)									
Buffalo River Trail Prairies SNA (Trempealeau)									
Coon Creek Fishery Area (La Crosse, Monroe, Vernon)	2010	2010	2011	2010				2011	2011
Elk Creek Fishery Area (Chippewa)		2010	2011						
Eureka Maple Woods SNA (Monroe)	2010	2010	2011						
Gordon's Bay Landing Public Access (Crawford)									
Half Moon Bottoms SNA (Jackson)			2010-11						
Half Moon Lake Fishery Area/Statewide Habitat Areas (Jackson)			2010-11	2010	2011				
Halls (Stockwell) Creek Fishery Area (Jackson)							2011		
Hulbert Creek Fishery Area (Sauk)			2010				2011		
Hulbert Creek Woods SNA (Sauk)			2010						
La Crosse Area Comprehensive Fishery Area (Crawford)	2010	2010					2011		2011
La Crosse Area Comprehensive Fishery Area (La Crosse)									
La Crosse Area Comprehensive Fishery Area (Monroe)					2011			2011	2011
La Crosse Area Comprehensive Fishery Area (Vernon)	2010	2010	2010-11	2010		2011		2011	2011
La Crosse River Fishery Area (Monroe)	2011	2011	2011	2010		2011			
Lake Menomoin Fishery Area (Dunn)									
Mount Hope Rearing Station (Grant)	2010	2010	2010	2010			2011	2011	2011
Mount Vernon Creek Fishery Area (Dane)	2010	2010	2010						2011
North Branch Trempealeau River Fishery Area (Jackson)							2011	2011	2011
Pine River System Fishery Area (Richland)									
Pinnacle Rock Rearing Station (Monroe)	2012	2012	2011				2011		
Portland Maples SNA (Monroe)	2010	2010	2011						

Driftless Area Study Stream (county)	Natural Communities	Plants	Breeding Bird Surveys	Herptiles	Bats	Small Mammals	Aquatic Invertebrates	Terrestrial Snails	Terrestrial Insects
REM-Ash Creek (Richland)									
REM-Baraboo River (Sauk)									
REM-Big Green River (Grant)									
REM-Big Spring Creek (Iowa)	2010	2010	2010	2010		2011	2011	2011	
REM-Bishop Branch Creek (Vernon)	2010	2010						2011	2011
REM-Blue River (Grant)	2010-11	2010-11	2010			2011	2011		2011
REM-Buffalo River (Trempealeau)									
REM-Camp Creek (Richland)									2011
REM-Castle Rock Creek (Grant)			2011				2011		
REM-Clear Creek (Eau Claire)									
REM-Conley Smith Creek (Iowa)									
REM-Elk Creek (Dunn, Richland)							2011		
REM-Elvers Creek (Dane)									
REM-Gilbert Creek (Dunn)									
REM-Hansell Creek (Richland)		2010	2010	2010			2011		
REM-Knapp Creek (Richland)									
REM-Little Platte River (Grant)									
REM-Love Creek (Iowa)	2010-11		2010-11	2010		2011		2011	2011
REM-Maple Dale Creek (Vernon)	2010	2010						2011	2011
REM-Milancthon Creek (Richland)		2010	2010	2010			2011	2011	2011
REM-Mill Creek (Richland)									
REM-Otter Creek (Dunn)									
REM-Pine Creek (Trempealeau)									
REM-Pine River (Richland)									
REM-Pompey Pillar Creek (Iowa)		2010	2010				2011	2011	2011
REM-Rainbow Springs (Vernon)									
REM-Rathbone Creek (Monroe)									
REM-So Branch Trempealeau River (Jackson)									
REM-Tainter Lake Spawning Marsh (Dunn)									
REM-Washington Coulee (Jackson)									
REM-West Fork Kickapoo River (Vernon)									
REM-Wilson Creek (Dunn)									
Rush River Delta SNA (Pierce)									
Sabin Springs Fishery Area (Richland)									
Sand Creek Fishery Area (Chippewa)									
Sand Creek Pines SNA (Monroe)		2010		2010					
Sand Creek Streambank Protection Area (Jackson)									
Sand Creek Streambank Protection Area (Monroe)	2010	2010	2010	2010	2011	2011	2011		
Smith Pond Fishery Area (Jackson)		2010					2011		
Snow Bottom SNA (Grant)	2010-	2010-	2010						

Driftless Area Study Stream (county)	Natural Communities	Plants	Breeding Bird Surveys	Herptiles	Bats	Small Mammals	Aquatic Invertebrates	Terrestrial Snails	Terrestrial Insects
	11	11							
Statewide Habitat Areas (Eau Claire)									
Statewide Habitat Areas (Iowa)								2011	
Statewide Habitat Areas (La Crosse)									
Statewide Habitat Areas (Pierce)			2010						
Statewide Habitat Areas (Sauk)									
Statewide Habitat Areas (Vernon)									
Statewide Public Access (Crawford)							2011		2011
Statewide Public Access (Richland)									
Stream Bank Protection Fee Program (Crawford)	2011	2011	2011			2011	2011	2011	
Stream Bank Protection Fee Program (Dane)									
Stream Bank Protection Fee Program (Eau Claire)	2010	2010	2010						2011
Stream Bank Protection Fee Program (Iowa)									
Stream Bank Protection Fee Program (Jackson)									
Tank Creek Fishery Area (Jackson)	2010	2010	2011				2011		
Trempealeau Lakes Fishery Area (Trempealeau)	2011	2011	2010	2010	2011				
Trout Creek Fishery Area (Iowa)	2010	2010	2010	2010		2011		2011	2011
Trump Coulee Rearing Station (Jackson)	2010	2010	2010	2010	2011	2011	2011	2011	
Willow Creek Fishery Area (Richland)		2010	2010				2011		2011

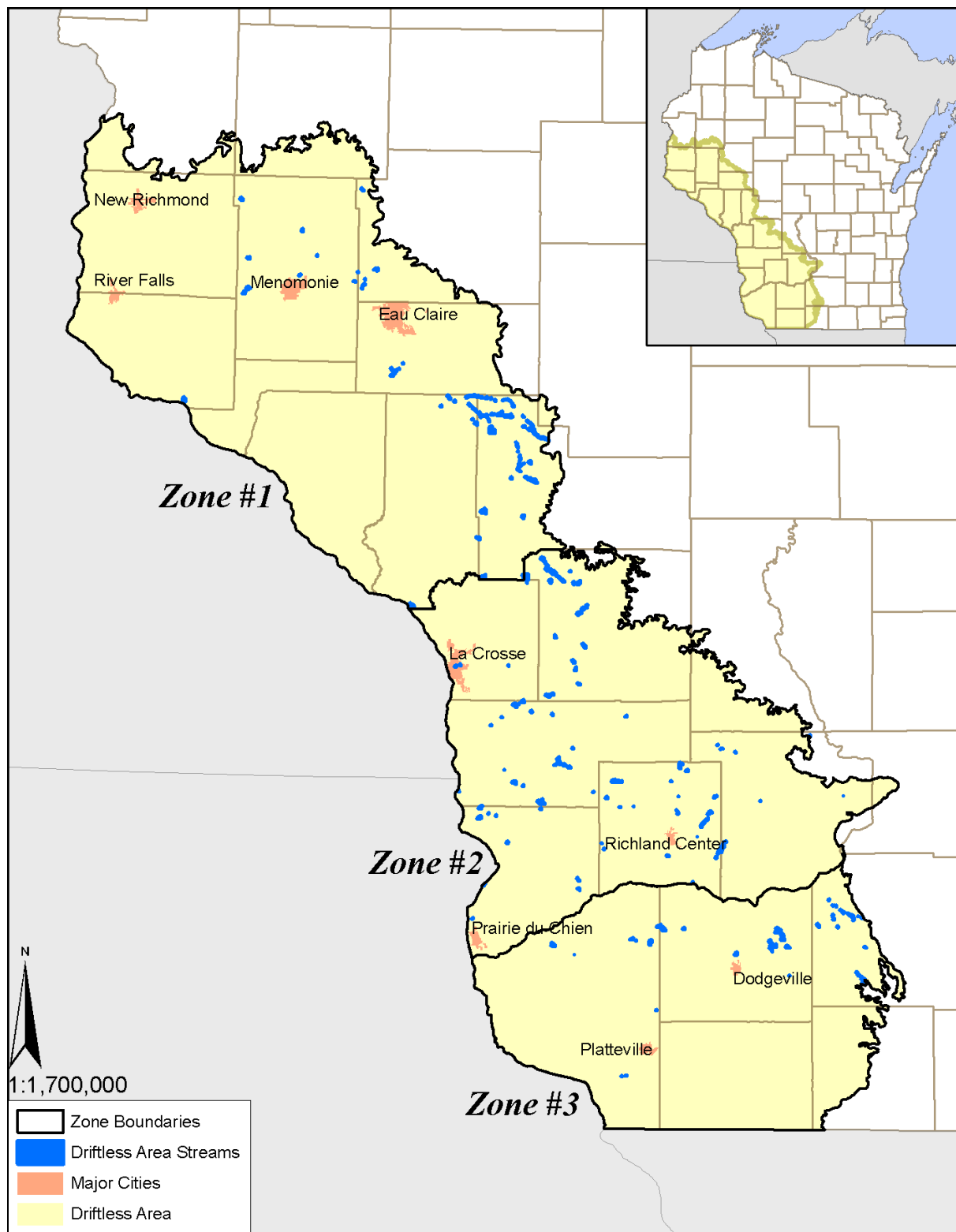


Figure 1. Location of Driftless Area Study Streams Study Area

(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)

Background on Past Efforts

A number of large-scale research and planning efforts identified the Driftless Area as well as Driftless Area Study Streams properties as being ecologically significant. The following are examples of such projects and the significant features identified.

Wisconsin Wildlife Action Plan: Conservation Opportunity Areas

The Wisconsin Wildlife Action Plan (WAP; WDNR 2006a) identified multiple Conservation Opportunity Areas (COA) within the Western Coulee & Ridges and Southwest Savanna Ecological Landscapes. These COAs are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility to protect when viewed from the global, continental, upper Midwest, or state perspective. Sixteen COAs in these ecological landscapes intersect at least one Driftless Area Study Streams property: Fort McCoy Barrens & Oak Savanna; Lower Kickapoo & Kickapoo; Coon Creek Mesic; Coulee Forests; Greensand Cuesta; Snow Bottom; Dodgeville & Wyoming Oak Woodland/Savanna; Rush Creek; Millville-Sandy Creek; Lower Black River to Black River Falls Dam; Mississippi Bluffs & Floodplain; Lower Wisconsin Bluffs & Floodplain; Lower Baraboo River; Upper Hall's Creek; Little Platte River & Tributaries; and Southwest Grasslands & Streams. For more details on these COAs, see the "Management Opportunities and Considerations for Biodiversity Conservation" section of this report.

Legacy Places

The Land Legacy Report (WDNR 2006b) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. There are many Land Legacy sites identified in the Driftless Area region. Below is a list of the Land Legacy sites identified that mention one of the Driftless Area Stream properties, primarily for their importance as headwaters:

- Badlands
- Baraboo River
- Black Earth Creek
- Black River
- Blue Mounds - Blanchardville Prairie and Savanna
- Copper Creek to Lynxville Hollows
- Coulee Coldwater Riparian Resources
- Hay River
- Kickapoo River
- La Crosse River
- Little and Big Green Rivers
- Mill Creek
- Pine River
- Platte River
- Rush Creek
- Snow Bottom - Blue River Valley
- Upper Mississippi River National Wildlife and Fish Refuge
- Upper Red Cedar River

Driftless Area Initiative

The Wisconsin DNR is a partner in the Driftless Area Initiative, an effort to encourage multi-state collaboration to improve water quality and natural resources in the Driftless Area of the Upper Mississippi River Basin.

The Nature Conservancy (TNC): Prairie Forest Border Ecoregional Plan The Nature Conservancy (2001) identified important Ecologically Significant Areas and restoration areas that will ensure the long-term survival of all viable native species and ecological communities. Conservation targets for the Prairie-Forest Border include all native natural communities, globally rare species and other species for whom experts feel the Prairie-Forest Border is an important part of their range. Below are the Ecologically Significant Areas that intersect at least one of the Driftless Area Study Streams properties:

- Baraboo Hills
- Black River-Meadow Valley-Bear Bluff
- Coon Creek
- Fort McCoy
- Kickapoo River
- Little Platte River
- Lower Chippewa & Red Cedar Rivers
- Lower Wisconsin River
- Military Ridge Prairie
- Morgan Coulee Prairie
- Pecatonica and Sugar Rivers
- Ridgeway Pine Relict
- Rush Creek
- Snow Bottom

Midwest Driftless Area Restoration Effort (DARE)

The Midwest Driftless Area Restoration Effort, of which the WDNR is a partner, is a geographically-focused, scientifically based, broad partnership formed to improve the trout resources throughout the four-state Driftless Area. It is part of the National Fish Habitat Action Plan. Partners work together in a coordinated regional approach to increase the effectiveness of watershed restoration by strategically linking upland conservation efforts with stream restoration (Trout Unlimited, n.d.; WDNR 2007a).

Wisconsin DNR Basin and Watershed Plans

The following Basin Plans have been developed that apply to water resources within the study area:

- Black-Buffalo-Trempealeau Basin Plan
 - Elk Creek Watershed Plan
- Bad Axe-LaCrosse Basin Plan
 - Rush Creek Watershed Plan
- Lower Wisconsin Basin Plan
 - Bear Creek Watershed Plan

Natural Resources Conservation Service (NRCS) Rapid Watershed Assessments (RWA)

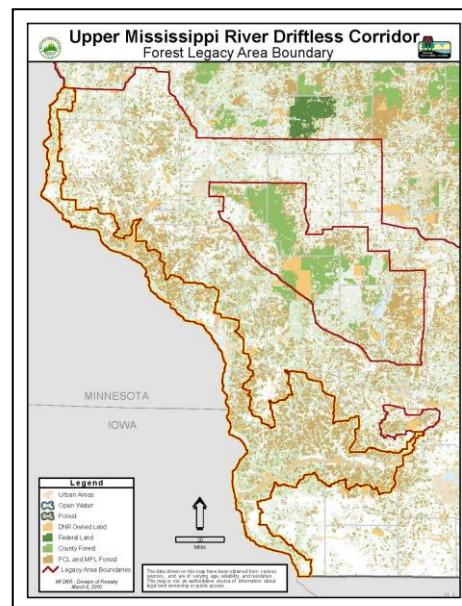
Rapid Watershed Assessments provide initial estimates to help determine where conservation investments would best address the concerns of landowners, counties, watershed groups, and other stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals. RWAs provide a foundation for watershed or area planning, and are available for the following watersheds within the study area:

- | | |
|------------------|--------------------------|
| • Coon-Yellow | • Lower Wisconsin |
| • La Crosse-Pine | • Grant-Little Maquoketa |
| • Lower Chippewa | • Pecatonica |
| • Red Cedar | |

Forest Certification

All DNR-managed lands, including state parks, wildlife areas, fishery areas, and natural areas, are recognized by the Forest Stewardship Council and the Sustainable Forestry Initiative as being responsibly managed (Forest Stewardship Council 2009). This certification emphasizes the state's commitment to responsibly managing and conserving forestlands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

Forest Legacy Program was created by Congress as part of the 1990 Farm Bill to identify and protect environmentally important private forestlands threatened with conversion to non-forest uses. The Forest Legacy Area boundaries of the Upper Mississippi River Driftless Corridor and the Baraboo River Areas contain many of the Driftless Area Study Streams properties. Currently, there are no funding opportunities for either of these areas through this program. The Baraboo Hills project was the first funded and completed project in Wisconsin's Forest Legacy Program. This project began in 2003 and was completed in 2007. The Baraboo Hills project involved 16 landowners, protected almost 1,000 acres of land and had the support of multiple governmental agencies, national and local conservation groups and the public.



Special Management Designations

State Natural Areas

State Natural Areas are places on the landscape that protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. Designation confers a significant level of land protection through state statutes, administrative rules, and guidelines. The SNAs that intersect with Driftless Area Study Streams properties are as follows [Property (Owner), number of acres]:

- Bear Creek Sedge Meadow (WDNR-FM), 89 acres
- Buffalo River Trail Prairies (WDNR-PR, -FM), 153 acres
- Coon Creek Cliffs (WDNR-FM), 27 acres
- Eureka Maple Woods (WDNR-ER, -FM), 135 acres
- Half Moon Bottoms (WDNR-FM), 202 acres
- Hulburt Creek Woods (WDNR-FM), 179 acres
- Portland Maples (WDNR-ER, -FM), 100 acres
- Rush Creek (WDNR-ER, -FM), 2,528 acres
- Rush River Delta (WDNR-ER), 340 acres
- Sand Creek Pines (WDNR-FM), 159 acres
- Snow Bottom (WDNR-ER, -FM), 342 acres

Important Bird Areas (IBA; WDNR 2007b) are critical sites for the conservation and management of Wisconsin's birds. Multiple IBAs are within or adjacent to Driftless Areas Streams properties:

- | | |
|-----------------------------|-------------------------------|
| ▪ Fort McCoy-Robinson Creek | ▪ Military Ridge-York Prairie |
| ▪ Governor Dodge State Park | ▪ Rush Creek Forest-Prairie |
| ▪ Kickapoo-Wildcat | ▪ Van Loon Bottoms |
| ▪ Lower Wisconsin River | ▪ Upper Mississippi River |

Wisconsin's Impaired Waters (303d)

Section 303(d) of the federal Clean Water Act requires states to develop a list of impaired waters ("303(d) list"). The identification and listing of waters as impaired is one step in a continual process of waterbody classification, assessment, and management, the ultimate goal of which is to protect, restore, and maintain the full potential of each waterbody to the maximum extent possible. The following are Driftless Area Study Streams that are currently designated 303(d):

- Tainter Lake (impoundment on Red Cedar River) was originally listed in 1998 due to eutrophication and elevated pH impairments of the fish and aquatic life use caused by excess total phosphorus.
- Snowden Branch a.k.a. Big Patch Creek (first five miles) was listed in 2004 as low priority due to degraded habitat caused by excessive sedimentation.
- Vermont Creek (first 3.5 miles) was listed in 2004 as low priority due to elevated water temperature and degraded habitat.
- Printz Creek (first three miles) was listed in 1998 as low priority due to degraded habitat.
- Trout Run (between river miles 2.3 and 7.6) was listed in 1998 as low priority due to elevated water temperature, low dissolved oxygen, and sediment load. The stream was severely impacted by an upstream feedlot and unrestricted cattle access.

Outstanding and Exceptional Resource Waters (ORW and ERW) are officially designated (Wisconsin Administrative Code NR 102.11) waters that provide outstanding recreational opportunities, support valuable fish and wildlife habitat, have good water quality, are not significantly impacted by human activities, and, thereby recognized as being the highest quality waters in the state. Outstanding Resource Waters typically do not have any point sources discharging pollutants directly to the water (for instance, no industrial sources or municipal sewage treatment plants), and no increases of pollutant levels are allowed. If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an ERW. Of Wisconsin's 53,413 streams and rivers, 254 are designated as ORW—fewer than 1%. Class I and II Trout streams are automatically included as ERW or ORWs per NR Chapter 102. Below are the Driftless Area Study Streams ORW and ERW waters:

Designated Outstanding Resource Waters (ORW):

Babb Hollow Creek	Elvers Creek	Rush Creek
Baraboo River	Farmers Valley Creek	Ryan Creek
Big Creek	Fisher Creek	Sand Creek
Big Elk Creek	Garfoot Creek	Smith Hollow Creek
Big Spring Branch	Graham Creek	Soper Creek
Biser Creek	Jenkins Valley Creek	South Fork Buffalo River
Bishop Branch	Kepler Branch	Spencer Creek
Black Earth Creek	Little La Crosse River	Spring Brook
Blue River	Little Platte River	Sugar River
Bostwick Creek	Lowes Creek	Tainter Creek
Buffalo River	Marble Creek	Tank Creek
Buften Hollow Creek	Milanthon Creek	Trempealeau River
Cheyenne Valley Creek	Mill Creek	Washington Coulee Creek
Clear Creek	North Branch Trempealeau River	Wheat Hollow Creek
Cook Creek	North Fork Buffalo River	Willow Creek
Cooley Creek	Pine Creek	
Copper Creek	Rindahl Creek	

Designated Exceptional Resource Waters (ERW):

Big Elk Creek	Little Green Reek	Strutt Creek
Black Earth Creek	Love Creek	Timber Coulee Creek
Camp Creek	Mt Vernon Creek	Trout Creek
Castle Rock Creek	Rullands Coulee Creek	
Elk Creek	Spring Coulee Creek	

Public Lands

All lands in the study area are owned by the Wisconsin Department of Natural Resources, and are managed by the Bureaus of Fisheries Management, Wildlife Management, Parks, and Endangered Resources. To help identify opportunities for collaboration and joint management, below are the non-Fisheries Management state properties that intersect at least one of the Driftless Area Study Streams properties:

- Buffalo River State Trail (WDNR-PR)
- Extensive and Scattered Wildlife Habitat (WDNR-WM)
- Governor Dodge State Park (WDNR-PR)
- Lower Wisconsin State Riverway (WDNR-WR)
- Military Ridge State Trail (WDNR-PR)
- North Bend Bottoms Wildlife Area (WDNR-WM)
- Statewide Non-Point Easement Program (WDNR-ZZ)
- Wildcat Mountain State Park (WDNR-PR)

In addition to these state properties, four Driftless Area Study Stream properties are adjacent or fall within federal properties:

- Upper Mississippi River Wild Life and Fish Refuge (UWFWS)
- Fort McCoy Military Reservation (USDOD)

Regional Ecological Context

Southwest Savanna and Western Coulee & Ridges Ecological Landscapes

This section is largely reproduced from the Ecological Landscapes of Wisconsin Handbook (WDNR In Prep. a).

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

The WDNR Fisheries Properties in the Driftless Area Study Streams are scattered throughout the **Southwest Savanna** Ecological Landscape and the **Western Coulee and Ridges** Ecological Landscape (WDNR In prep. a) (Figure 2). While the **Western Prairie** Ecological Landscape is also within the Driftless Area of Wisconsin, there are no Driftless Area Study Streams properties within its boundaries.

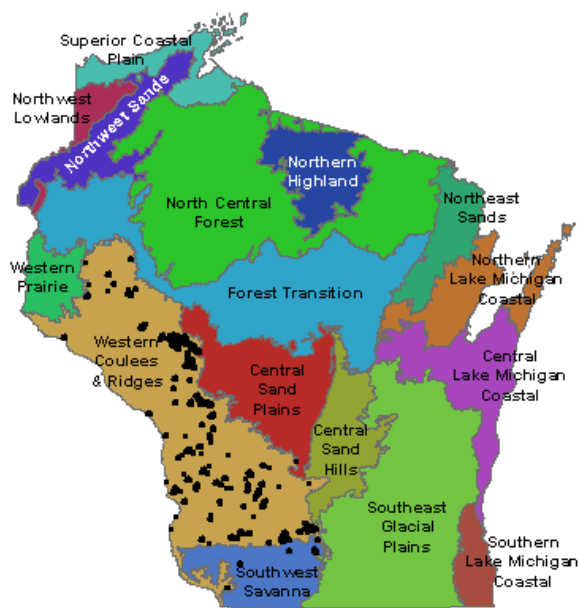


Figure 2. Ecological Landscapes of Wisconsin and the study area.
(Property boundaries enlarged for visibility.)

The **Western Coulee and Ridges Ecological Landscape** is the largest of the 16 Ecological Landscapes. It is located in southwestern and west-central Wisconsin within the Driftless Area, a region that escaped glaciation during the last glacial period. The Driftless Area is noted for its steeply dissected terrain, extensive network of streams, and lack of glacial deposits (although glacial outwash materials do occur in

river valleys). Several large rivers including the Wisconsin, Mississippi, Chippewa, Kickapoo and Black flow through or border this Ecological Landscape.

Historical vegetation consisted of southern hardwood forest, oak savanna, and prairie, along with wetlands (forested and open) along rivers and streams. With Euro-American settlement, most of the level land on ridgetops and in valley bottoms was cleared for agriculture. The untillable steep slopes between valley bottom and ridgetop either remained in forest or grew up into oak-dominated forests when early wildfire-suppression policies were instituted.

Current vegetation of the Western Coulee and Ridges Ecological Landscape is a mix of forest (40% of total cover), agriculture, and grassland, with wetlands mostly restricted to the river valleys. The primary forest cover is oak-hickory (*Quercus* sp.-*Carya* sp.), while maple-basswood (*Acer* sp.-*Tilia americana*) forests are common in cooler, moister areas. Bottomland hardwoods occur in the valley bottoms of major rivers. Relict conifer stands are rare and are associated with steep-faced outcrops with cool microclimates. This Ecological Landscape has few natural lakes, though oxbows and ponds may be found with large river floodplains. Impoundments have been installed on a number of rivers to create man-made lakes.

The **Southwest Savanna Ecological Landscape** is also located within the Driftless Area of Wisconsin. Although no natural lakes occur in this Ecological Landscape, several large rivers flow through, including the Pecatonica, Galena, and Yellowstone Rivers. Historical vegetation of the **Southwest Savanna Ecological Landscape** consisted primarily of prairie, oak savanna, and oak-dominated forests.

Only 11% of current land cover is classified as timberland in the **Southwest Savanna Ecological Landscape**. Almost three-quarters of the land here is in agricultural crops, with lesser amounts of grasslands, barrens, and urban areas. The major forest types are oak-hickory and maple-basswood. Prairie and oak savanna remnants occur mostly on rocky hilltops and slopes that were untillable; many of these sites are currently pastures. Relict stands of pine (*Pinus* spp.) occur on bedrock outcroppings along some stream systems.

Regional Biodiversity Needs and Opportunities

Opportunities for sustaining natural communities in the Southwest Savanna and Western Coulee & Ridges Ecological Landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007) and later focused on wildlife SGCN and their habitat in the Wisconsin Wildlife Action Plan (WDNR 2006a). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the Ecological Landscape while maintaining important components of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within the Southwest Savanna and Western Coulee & Ridges Ecological Landscape.

There are management opportunities for 28 natural communities in the Southwest Savanna Ecological Landscape. Of these, six are considered "major" (Table 1). Similarly, there are management opportunities for 45 natural communities in the Western Coulee and Ridges Ecological Landscape, 24 of which are considered "major." A "major" opportunity indicates that the natural communities can be sustained in the Ecological Landscape, either because many significant occurrences of the natural community have been recorded in the landscape or major restoration activities are likely to be successful

in maintaining the community's composition, structure, and ecological function over a longer period of time. An additional ten natural communities are considered "important" in the Southwest Savanna Ecological Landscape and 13 in the Western Coulee and Ridges. An "important" opportunity indicates that although the natural community does not occur extensively or commonly in the Ecological Landscape, one to several occurrences are present and are important in sustaining the community in the state. In some cases, important opportunities may exist because the natural community may be restricted to just one or a few Ecological Landscapes within the state and there may be a lack of opportunities elsewhere.

Table 2. Major Natural Community Management Opportunities in the Southwest Savanna and Western Coulees & Ridges Ecological Landscape (EMPT 2007; WDNR 2006a)

Natural Community	Southwest Savanna	Western Coulees & Ridges
Algific Talus Slope		X
Bedrock Glade		X
Cedar Glade		X
Coldwater streams		X
Coolwater streams		X
Dry Cliff		X
Dry Prairie	X	X
Dry-mesic Prairie	X	X
Emergent Marsh		X
Floodplain Forest		X
Hemlock Relict		X
Mesic Prairie		X
Moist Cliff		X
Oak Barrens		X
Oak Opening	X	X
Oak Woodland	X	X
Pine Relict		X
Sand Prairie		X
Shrub Carr		X
Southern Dry Forest		X
Southern Dry-mesic Forest		X
Southern Mesic Forest		X
Submergent Marsh		X
Surrogate Grasslands	X	X
Warmwater streams	X	X

Rare Species of the Southwest Savanna and Western Coulee & Ridges Ecological Landscape

Numerous rare species are known from the Southwest Savanna and Western Coulee & Ridges Ecological Landscapes. "Rare" species include all of those species that appear on the WDNR's NHI Working List (*Wisconsin Natural Heritage Working List*), including those that are classified as "Endangered," "Threatened," or "Special Concern." Tables 2 and 3 list the number of species known to occur in these two landscapes based on information stored in the NHI database as of February 21st 2012.

Table 3. Listing Status for rare species in the Southwest Savanna Ecological Landscape as of 2012.

Source is the NHI database. Listing Status is based on the Working List published June 2011.

Listing Status	Taxa					Total Fauna	Total Plants	Total Listed
	Mammals	Birds	Herptiles	Fishes	Invertebrates			
State Endangered	0	1	1	2	2	6	9	15
State Threatened	2	4	1	2	3	12	14	26
State Special Concern	3	5	5	1	10	24	16	40
Federally Endangered	0	0	0	0	0	0	0	0
Federally Threatened	0	0	0	0	0	0	1	1
Federal Candidate	0	0	0	0	0	0	0	0

Table 4. Listing Status for rare species in the Western Coulees & Ridges Ecological Landscape as of 2012.

Source is the NHI database. Listing Status is based on the Working List published June 2011.

Listing Status	Taxa					Total Fauna	Total Plants	Total Listed
	Mammals	Birds	Herptiles	Fishes	Invertebrates			
State Endangered	0	6	4	7	17	34	18	52
State Threatened	4	9	2	9	9	33	28	61
State Special Concern	5	13	11	10	80	119	68	187
Federally Endangered	0	0	0	0	3	3	0	3
Federally Threatened	0	0	0	0	0	0	2	2
Federal Candidate	0	0	1	0	2	3	0	3

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need, or "SGCN," as animals that have low and/or declining populations that are in need of conservation action. They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g., dragonflies, butterflies, and freshwater mussels) that may be:

- Already listed as threatened or endangered;
- At risk because of threats to their life history needs or their habitats;
- Stable in number in Wisconsin, but declining in adjacent states or nationally.
- Of unknown status in Wisconsin and suspected to be vulnerable.

There are five vertebrate SGCN significantly associated with the Southwest Savanna Ecological Landscape and 16 vertebrate SGCN significantly associated with the Western Coulee & Ridges Ecological Landscape (See Appendix E). This means that the species is (and/or historically was) significantly associated with the Ecological Landscape, and restoration of natural communities with which this species is associated in the Ecological Landscape would significantly improve conditions for the species.

Description of the Study Area

Location and Size

The Driftless Area Study Streams study area consists of 174 properties on 17,858 acres² in Chippewa, Crawford, Dane, Dunn, Eau Claire, Grant, Iowa, Jackson, La Crosse, Monroe, Pierce, Richland, Sauk, Trempealeau and Vernon Counties. All are owned by the Wisconsin DNR and managed by the Bureau of Fisheries Management. See Figure 1 for a map of the study area.

Ecoregion

Landtype Associations

Nested hierarchically within each Ecological Landscape are NHFEU Subsections which are further divided into Landtype Associations (LTAs) (Cleland et al. 1997). These LTAs are finer scaled polygons (areas of 10,000 – 300,000 acres) that make up each subsection, and are characterized by repeating patterns of characteristic landforms, soil groups, regional climate, and potential vegetation; these are most relevant to this study. Driftless Area Study Streams properties fall within the following LTAs (described below roughly in order from north to south; also see Figures 3 and 4):

- **Knapp Loess Hills (222La03).** The characteristic landform pattern is hilly dolostone and sandstone. Soils are well-drained to somewhat poorly drained silt loam over non-calcareous silty loess, loamy residuum, or sandy loam till, much over glauconitic sandstone bedrock. Several Driftless Area Study Streams properties fall within this LTA, in Zone #1. This LTA comprises 1% of Driftless Area Study Streams.
- **Hay River Sandstone Hills (222La02).** The characteristic landform pattern is hilly sandstone. Greater than 70% of the area has bedrock within five feet of the land surface. Soils are predominantly well-drained fine sandy loam, loamy sand, or silt loam over non-calcareous loamy or sandy residuum or over sandy or silty loess, all over glauconitic sandstone bedrock. Two Driftless Area Study Streams properties fall within this LTA, in Zone #1. This LTA comprises 1% of Driftless Area Study Streams.
- **Red Cedar/Chippewa Valley Trains (222La01).** The characteristic landform pattern is nearly level outwash plain. Soils are predominantly well-drained loamy sand over outwash. Several Driftless Area Study Streams properties fall within this LTA, in Zone #1. This LTA comprises 4% of Driftless Area Study Streams.
- **Eau Claire/Lowes Valley Trains (222Lb03).** The characteristic landform is outwash valley train and floodplain. Soils are excessively drained to well-drained loamy sand or loamy fine sand over non-calcareous sand outwash. One Driftless Area Study Streams property falls within this LTA, in Zone #1. This LTA comprises 2% of Driftless Area Study Streams.
- **Boone Valleys and Hills (222Lb05).** The characteristic landform pattern is hilly summits surrounded by lower sandstone hills and narrow valleys. Greater than 70% of the area has bedrock within five feet of the land surface. Soils are well-drained loams and sands -- sandy loam, silt loam, or loamy fine sand over non-calcareous sandy or loamy alluvium, hillslope alluvium, or colluvium; some areas over sandstone bedrock. Numerous Driftless Area Study Streams properties fall within this LTA, both in Zone #1 and #2. This LTA comprises 35% of Driftless Area Study Streams.

² Based on Geographical Information System (GIS) acreage derived from ArcSDE/Oracle WDNR Managed Lands (DML) shapefile as of September 2009.

- **Trempealeau Sandstone Hills (222Lb07).** The characteristic landform pattern is moderately steep, with hills and narrow valleys of sandstone. Greater than 70% of the area has bedrock within five feet of the land surface. Soils are well-drained silt loam or sandy loam over non-calcareous silty loess or over loamy, sandy, or clayey residuum or colluvium; most over glauconitic sandstone or dolostone bedrock. Three Driftless Area Study Streams properties fall within this LTA, in Zone #1 and 2. This LTA comprises 3% of Driftless Area Study Streams.
- **Northfield Low Hills (222Lb06).** The characteristic landform pattern is hilly pediment and stream terrace flood plain. Greater than 70% of the area has bedrock within five feet of the land surface. Soils are well-drained silt loam over non-calcareous silty loess or over loamy or sandy hillslope alluvium or residuum; many areas over sandstone bedrock. Several Driftless Area Study Streams properties fall within this LTA, in Zone #2. This LTA comprises 3% of Driftless Area Study Streams.
- **Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16).** The characteristic landform pattern is hilly with steep backslopes and loess covered tunnel city hills and valleys common. Soils are well-drained silt loam or sandy loam over non-calcareous silty loess or over loamy or clayey residuum or colluvium; most over limestone or sandstone bedrock. Numerous Driftless Area Study Streams properties fall within this LTA, in Zone #2. This LTA comprises 13% of Driftless Area Study Streams.
- **LeFarge Hills and Valleys (222Ld02).** Soils are well-drained silt loam over non-calcareous loamy, sandy, or clayey residuum or over silty loess; most areas over glauconitic sandstone bedrock. Numerous Driftless Area Study Streams properties fall within this LTA, all in Zone #2. This LTA comprises 6% of Driftless Area Study Streams.
- **Hills and Valleys - Wisconsin River Drainage (222Lc18).** Soils are well-drained to moderately well-drained silt loam or sandy loam over non-calcareous clayey or loamy residuum or over silty loess. Most areas occur over limestone, sandstone, or shale bedrock. Numerous Driftless Area Study Streams properties fall within this LTA, in Zones #2 and 3 north and south of the Wisconsin River. This LTA comprises 24% of Driftless Area Study Streams.
- **Platteville Savanna (222Le02).** The characteristic landform pattern is sloping, with summits, shoulders, and backslopes of ridges common. Soils are well-drained silt loam over calcareous and non-calcareous clayey, sandy, or loamy residuum, or over non-calcareous silty loess. Most areas occur over dolostone, limestone, or sandstone bedrock. Several Driftless Area Study Streams properties fall within this LTA, all in Zone #3. This LTA comprises 2% of Driftless Area Study Streams.
- **Mississippi River Valley Train-North (222Lc08).** The characteristic landform pattern is nearly level river islands and floodplains. Soils are poorly drained to excessively drained sand or loamy fine sand over non-calcareous sand alluvium or outwash. Four Driftless Area Study Streams properties fall within this LTA, in all three zones. This LTA comprises 3% of Driftless Area Study Streams.
- **Eau Claire Sandstone Hills (222Lb02), Richland Ridge (222Ld01), Baraboo Basin Moraines (222Ld06), Mississippi River Valley Train-South (222Lc17), Eroded pre_Illinoian Ground Moraines (222Lc12), Viroqua Ridge (222Lc15), Wisconsin Dells (222Ra02), Spaulding Uplands (222Rb02).** These LTAs each comprise <1% of the Driftless Area Study Streams study area.

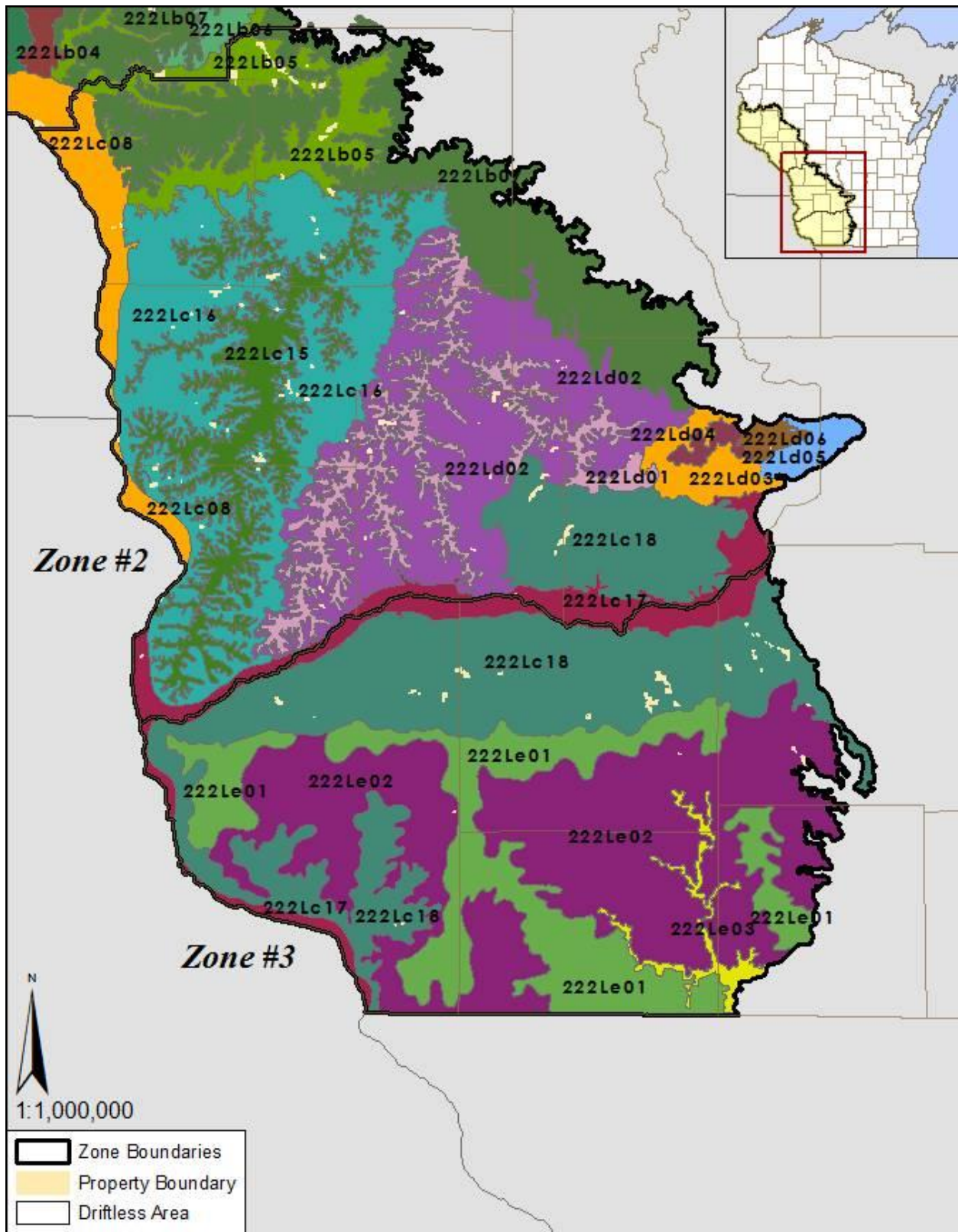


Figure 4. Landtype Associations for Driftless Area Study Streams, Zones 2 & 3.
(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)

Physical Environment

Geology, Landforms, and Glacial Geology

The Driftless Area of Wisconsin lies in the southwestern and west-central part of the state (Figure 1) and covers about 12,700 square miles. The region escaped glaciation in the most recent glacial epochs, although glacial meltwater from surrounding areas rushed through the valley bottoms. This unique combination of geological influences resulted in a dramatic terrain -- deeply dissected valleys and steep-sided, rocky bluffs.

The Driftless Area is characterized by an eroded plateau, with bedrock overlain by varying thicknesses of loess (wind-blown silt). Loess was probably blown in from the Mississippi River during glacial periods, thus its depths are deepest at or near the Mississippi (tens of feet thick) and become shallower as one moves east (about two feet thick in Madison area) (Dott and Attig 2004). Dolomite, sandstone, and limestone are the dominant bedrock types, with lesser amounts of shale and gneiss. Outcrops of Paleozoic bedrock are common, especially on the bluffs that rise above the Wisconsin and Mississippi Rivers. The preponderance of Karst topography (when layers of soluble bedrock are dissolved by water) means that caves are common throughout the Driftless Area -- about 60 have been identified (Dott and Attig 2004).

The influence of glacial meltwater is most evident in the complex network of streams and tributaries that deeply cut into the bedrock. Other notable relicts, however, are broad sandy outwash plains along the major rivers, especially the Black and the Wisconsin. The Black River channel served as the primary outlet for Glacial Lake Wisconsin: When the Green Bay Lobe of the Laurentide Ice sheet dammed the Wisconsin River at the Baraboo Hills, the water in the lake rose until it spilled over into the lowest point -- the Black River (Dott & Attig 2004). The ancient sandy outwash plains along both rivers extend far beyond the extent of their modern-day floodplains.

Soils

Based on descriptions of the LTAs within which Driftless Area Study Streams properties fall (Cleland et al. 1997), most soils in the study area are well-drained to moderately-well-drained silt loams, sandy loams, or loamy sands. Limestone and sometimes sandstone bedrock often lie close to the surface, resulting in shallow soils and exposed bedrock (often in the form of cliffs or outcrops). Alluvial deposits occur along stream and river bottoms, yielding moderately-drained to poorly-drained soils. Glacial outwash plains along the major rivers are characterized by varying depths of sand and gravel.

In his book "The Sand County Almanac," Aldo Leopold expressed concern for the soils of this region (Leopold 1949): "By 1930 it had become clear to all except the ecologically blind that southwestern Wisconsin's topsoil was slipping seaward." This soil loss was a direct result of intensive agricultural practices on steep, erodible slopes, particularly plowing, grazing, and logging. In 1933, a new federal agency, the Soil Erosion Service, selected Coon Creek near La Crosse as the first watershed in which to demonstrate the values of soil conservation measures (Helms 1983). This agency became the Soil Conservation Service (SCS) in 1935. By working with farmers to implement agricultural contouring, strip cropping, and terracing, the destructive forces of erosion were eventually reversed, heralding a new era of soil conservation in agriculture.

Hydrology

The Driftless Area is characterized by a finely dissected network of interconnected streams and tributaries. Springs and spring seeps feed hundreds of cold- and cool-water streams, many of which harbor trout (Figure 5), emphasizing the importance of trout fishing as a recreational past-time as well as an economic base for the region. Within the Western Coulee and Ridges Ecological Landscape alone, over 4,000 springs have been mapped (WDNR In prep. a). Springs are critical for maintaining proper temperatures and dissolved oxygen in streams for the many sensitive aquatic invertebrates and rare native fish (as well as brook trout [*Salvelinus fontinalis*]) that reside there.

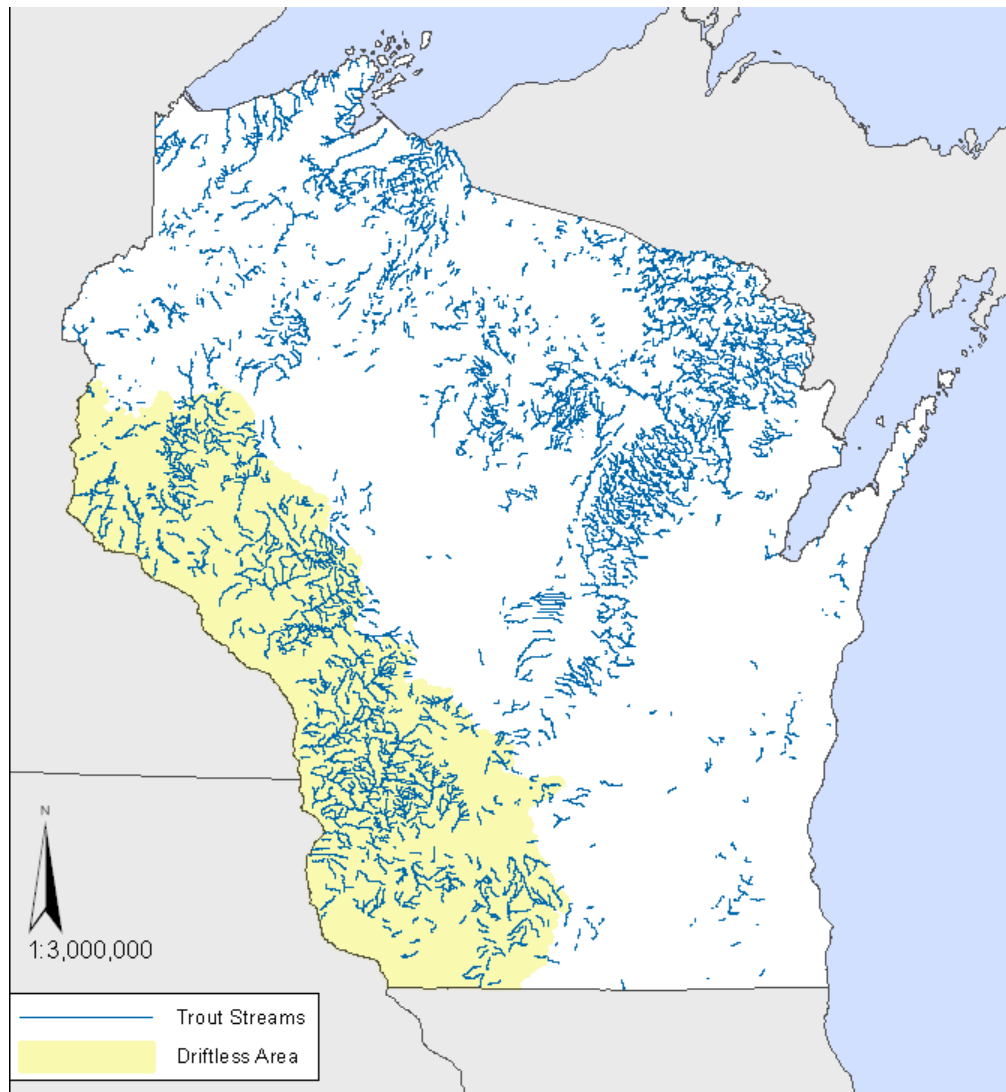


Figure 5. Trout Streams of Wisconsin.

Source: Wisconsin DNR Trout Streams shapefile (WDNR 2008)

The lack of direct, recent glacial influence on the region resulted in a marked absence of lakes and wetlands, other than those that occur locally along river floodplains. In many places, impoundments were installed on streams to create artificial lakes. The WDNR maintains a number of artificial fish-rearing ponds throughout the study area.

On the Mississippi River, a series of locks and dams were installed during the 1930's. These dams dramatically altered the hydrology of the river and its associated ecosystems. One can discern three distinct zones between each dam (Dott and Attig 2004): 1) Immediately above each dam is a large, open reservoir lake; 2) Upstream from the lake is an extensive marsh with backwater sloughs; and 3) Between the marsh and the next dam upstream, a network of braided channels, sloughs, and small lakes course through a floodplain forest complex.

Although most Driftless Area Study Streams properties are associated with smaller streams and creeks, several are directly associated with large rivers (Stream Order 6 or larger), including the Hay River, Red Cedar River, Black River, and Mississippi River. Nine other large rivers also 'influence' the study area: Chippewa River, Eau Claire River, Trempealeau River, Kickapoo River, Blue River, Grant River, Platte River, Baraboo River, and East Branch Pecatonica River.

Vegetation

Historical Vegetation

Data from the original Public Land Surveys are often used to infer forest composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American settlement. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Although data are limited to a specific snapshot in time, they provide valuable insights into Wisconsin's ecological capabilities. Maintaining or restoring some lands to more closely resemble historic systems and including some structural or compositional components of the historic landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In prep. a).

The early vegetation of Wisconsin was mapped by Robert Finley and published in 1976 (Finley 1976), and was based on notes and maps from the original Public Land Surveys. Finley's map indicates that historical vegetation of the Driftless Area consisted of prairie and savanna on ridge tops, dry-mesic forest on moister slopes, mesic forests in protected valleys and on north-facing slopes, wet-mesic to mesic prairies and sedge meadows along rivers, and marshes and floodplain forests within the river floodplains (Figures 6 and 7). Prairie was also found on dry, thin soiled, south- and west-facing slopes, especially on bluffs along the bigger rivers. Pine Relicts were found throughout the Driftless Area on rocky cliffs and north-facing slopes, and harbored an assemblage of plants that were more typical of northern Wisconsin (Curtis 1959). This generalized description of the larger landscape is equally applicable to the Driftless Area Study Streams properties.

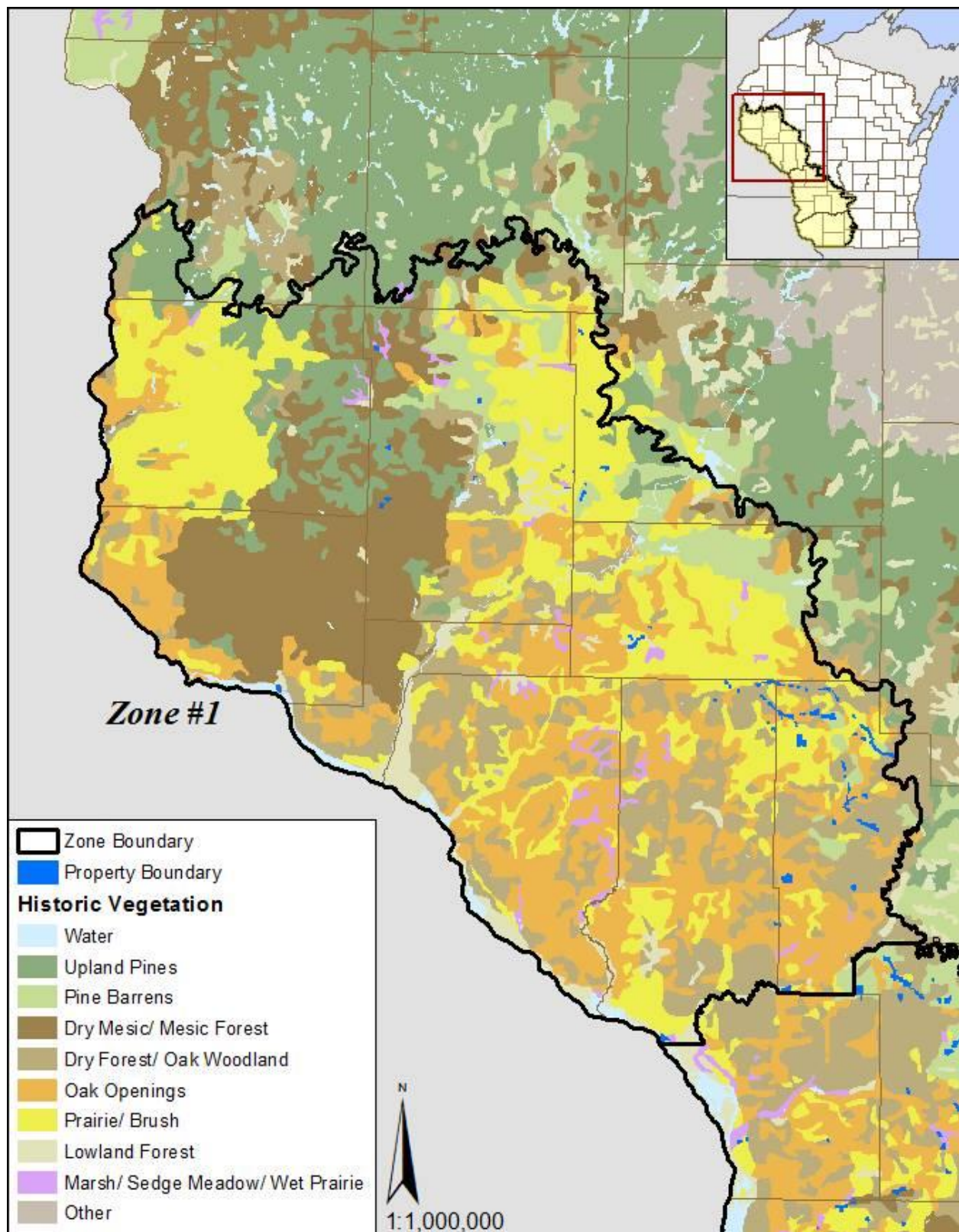


Figure 6. Vegetation of Driftless Area Study Streams prior to Euro-American settlement (Zone 1)
 (Data from Finley, 1976. *The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.*)

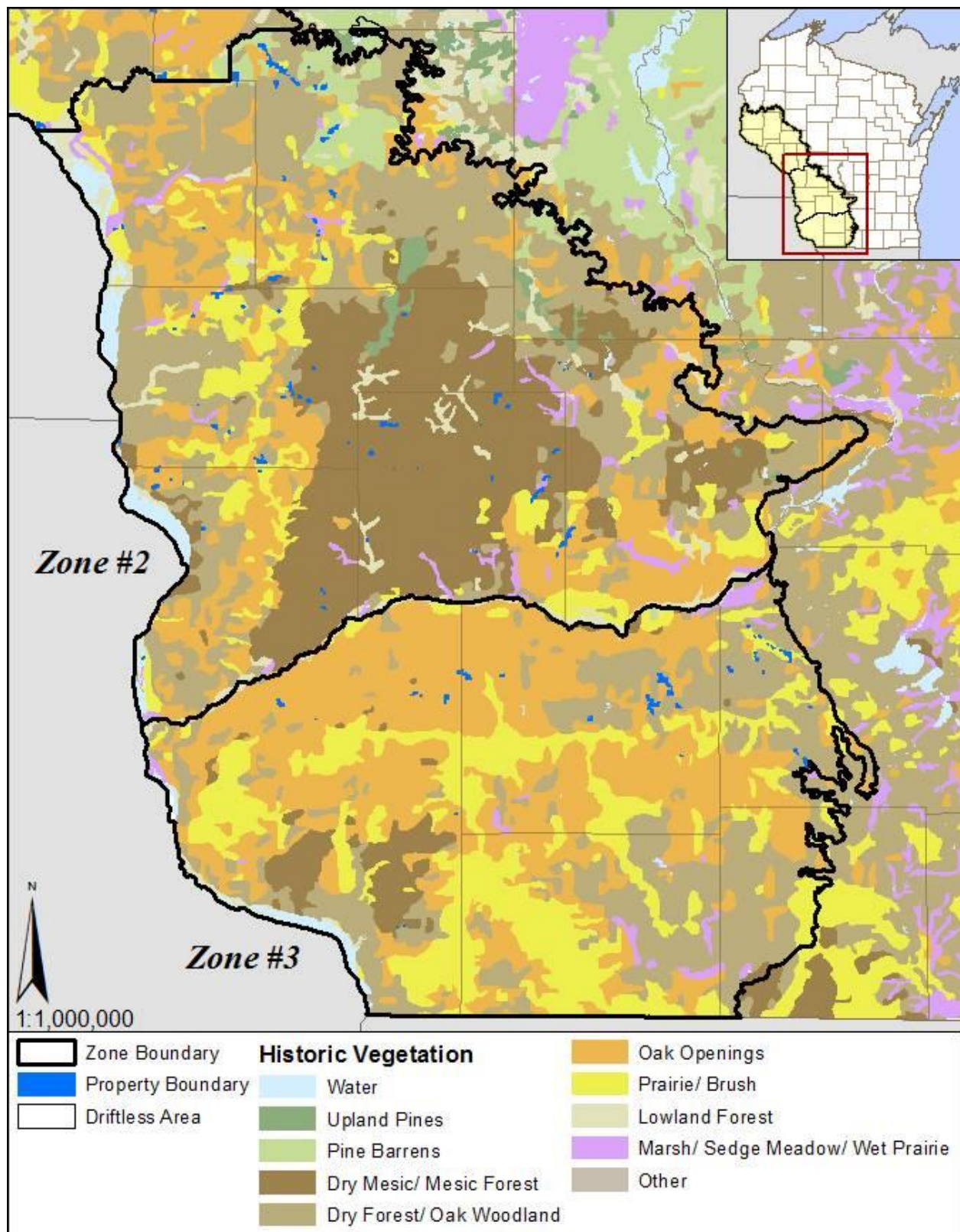


Figure 7. Vegetation of Driftless Area Study Streams prior to Euro-American settlement (Zones 2 & 3)
 (Data from Finley, 1976. The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)

Current Vegetation

Many of the factors that historically impacted vegetation continue to impact the study area today, and include but are not limited to geology, soils, hydrology, and climate. These factors are superseded in many areas, however, by more recent human influences on the land, particularly conversion of bluff tops and valley bottoms to agriculture, logging, installation of impoundments, fire suppression, and the introduction and spread of non-native invasive species. Today, nine general land cover types dominate the Driftless Area landscape: agriculture, barren (i.e., bare soil), deciduous forest, coniferous forest, wetland, grassland, shrubland, open water, and urban (Figures 8 and 9). In Wisconsin savannas may be classified as grasslands, shrublands, or forest types.

The landscape-scale generalization of cover types described above helps us visualize the study area within a larger context. But which cover types typify the properties within the study area for this report? The most obvious commonality among all Driftless Area Study Streams properties is the presence of water, most often in the form of small, cool-water streams, less often in the form of rivers or artificial impoundments. Grass- or sedge-dominated wetlands, often brushy, most commonly create a buffer along the smaller creeks and streams, while a combination of Floodplain Forest and open/brushy wetlands may straddle larger rivers. The dominant upland forest cover is oak-hickory (this includes savannas and dry-mesic forests), while maple-basswood forests (i.e., mesic forests) are common in cooler, moister areas such as north-facing slopes. Rock outcrops and cliffs are common throughout the study area sites, and have several different natural communities associated with them, including Dry Cliff, Moist Cliff, and Pine Relict. Degraded remnant Dry Prairies are found on thin-soiled bluffs, especially on steep south- or west-facing slopes. Detailed descriptions of the natural community types that figure prominently on Driftless Area Study Streams properties are provided below:

Graminoid-Dominated Wetlands

Most open wetlands dominated by grasses or sedges (graminoids) in the study area were drained in the past, then plowed or grazed. As wetlands were destroyed or degraded, stream flow during rain events became flashier, resulting in deeply-incised stream banks (sometimes 10-15 feet high) and heavy deposition of sediment. Nutrient-laden runoff from proximal urban and agricultural lands further contributed to the degradation of these wetlands. Wetlands that experienced such extensive disturbance are typically dominated by reed canary grass (*Phalaris arundinacea*) and/or lake sedge (*Carex lacustris*), and harbor a small number of forb generalists such as sawtooth sunflower (*Helianthus grosseserratus*), spotted Joe-Pye-weed (*Eupatorium maculatum*), giant goldenrod (*Solidago gigantea*), swamp aster (*Aster puniceus*), New England aster (*Aster novae-angliae*), orange jewelweed (*Impatiens capensis*), and tall meadowrue (*Thalictrum dasycarpum*).

Project surveyors occasionally encountered less disturbed graminoid-dominated wetlands, most often in the form of Southern Sedge Meadow. Southern Sedge Meadow occurs on saturated soils (muck or peat), and is typically dominated by tussock sedge (*Carex stricta*) and blue-joint grass (*Calamagrostis canadensis*). Some sedges, especially the tussock sedge, form hummocks; these may be accentuated by grazing and frost action. Common sedge meadow associates are northern water-horehound (*Lycopus uniflorus*), panicled aster (*Aster lanceolatus* var. *simplex*), blue flag (*Iris virginica*), Canada goldenrod (*Solidago canadensis*), spotted Joe-Pye-weed, broad-leaved cat-tail (*Typha latifolia*), and swamp milkweed (*Asclepias incarnata*). Good examples of Southern Sedge Meadow within the study area occur at Rush Creek Fishery Area in Crawford County and at Bear Creek Fishery Area in Richland and Sauk Counties.

The least common form of minimally disturbed graminoid-dominated wetland that surveyors encountered was Wet-mesic Prairie, which typically occurs as small inclusions within a larger sedge meadow/Shrub-carr matrix. This community is dominated by tall grasses including big bluestem (*Andropogon gerardii*),

bluejoint grass, and prairie cordgrass (*Spartina pectinata*). The forb component can be quite diverse, and typically will include azure aster (*Aster oolentangiensis*), shooting-star (*Dodecatheon meadia*), sawtooth sunflower, yellow coneflower (*Ratibida pinnata*), stiff goldenrod (*Solidago rigida*), and Culver's root (*Veronicastrum virginicum*). Examples of small Wet-mesic Prairie inclusions can be found at Willow Creek Fishery Area in Richland County.

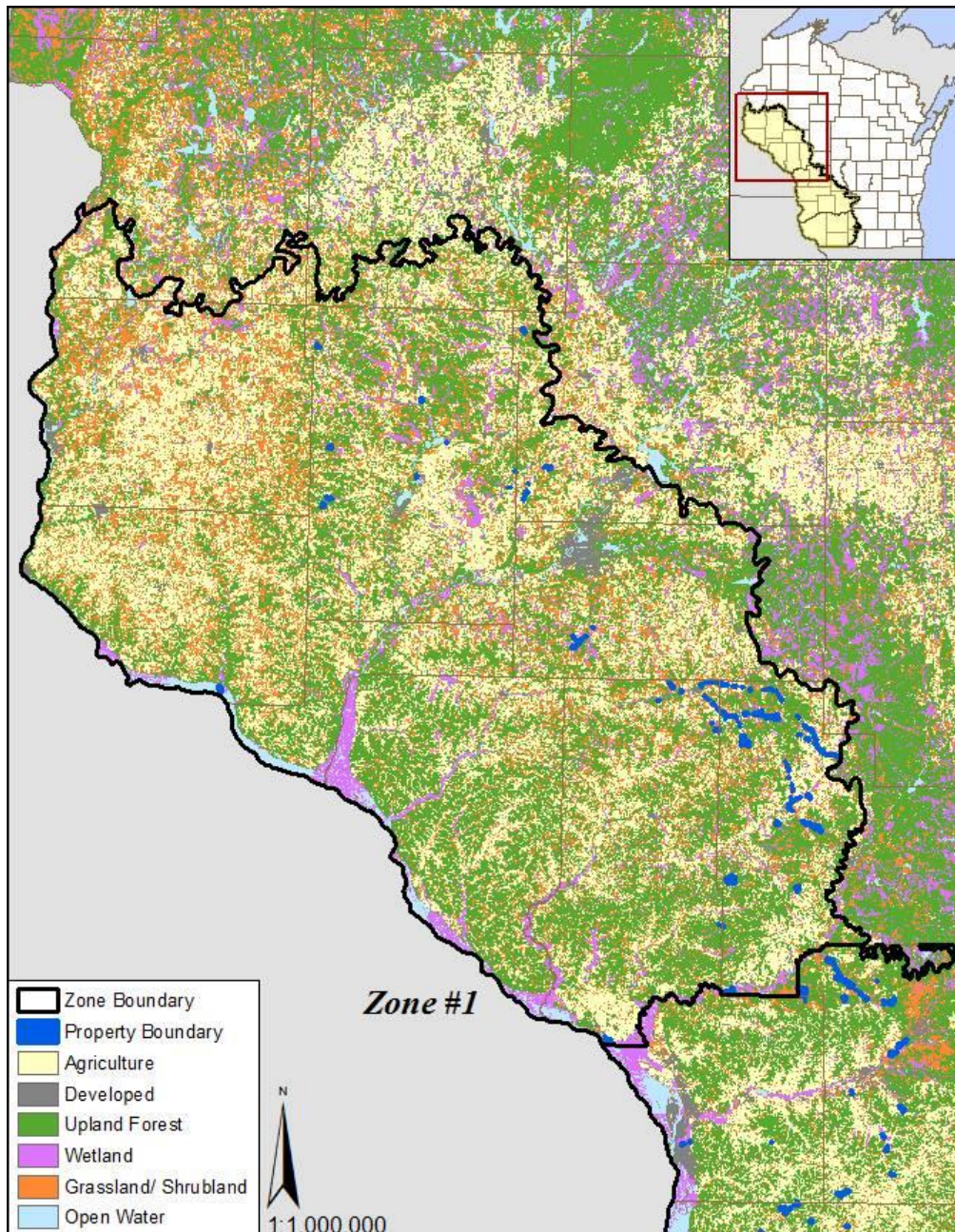


Figure 8. Landcover of Driftless Area Study Streams (Zone 1).

[From WDNR Wiscland GIS coverage (WDNR 1993). The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.]

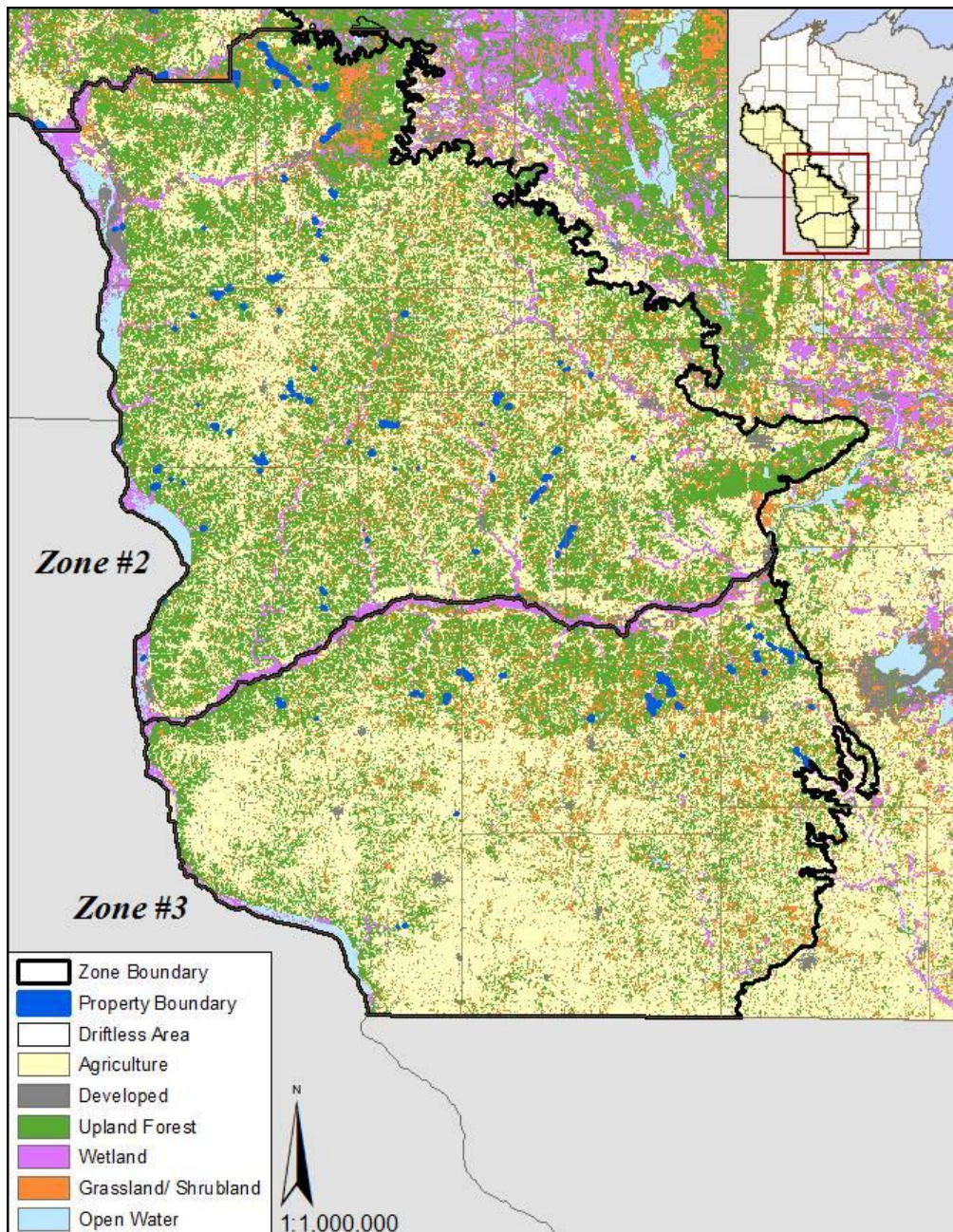


Figure 9. Landcover of Driftless Area Study Streams (Zones 2 & 3).

[From WDNR Wisland GIS coverage (WDNR 1993). The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.]

Shrub-carr

This wetland community occurs on saturated to seasonally-flooded soils and is dominated by tall shrubs such as red-osier dogwood (*Cornus stolonifera*), white meadowsweet (*Spiraea alba*), and various willows (*Salix discolor*, *S. bebbiana*, and *S. exigua*). Vegetation growing underneath the woody species is usually typical of Southern Sedge Meadow, most commonly reed canary grass, less commonly blue-joint grass, lake sedge, and tussock sedge. Given that artificial drainage and fire suppression contribute

to expansion of Shrub-carr communities into open wetlands (Eggers and Reed 1987), this community type is well-represented throughout the study area.

Floodplain Forest

This is a lowland hardwood forest community that occurs within the floodplain of large rivers, usually stream order 3 or higher. Canopy dominants typically include silver maple (*Acer saccharinum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), swamp white oak (*Quercus bicolor*), and eastern cottonwood (*Populus deltoides*). Dominant ground layer species include reed canary grass, wood nettle (*Laportea canadensis*), stinging nettle (*Urtica dioica*), jumpseed (*Polygonum virginianum*), and cut-leaved coneflower (*Rudbeckia laciniata*). Significant stands of Floodplain Forest occur in the study area along the Black River in Jackson County (especially Half Moon Bottoms SNA), along the Rush River in Pierce County (especially Rush River Delta SNA), along Cooley Creek in Crawford County (including part of Rush Creek SNA), and along the Mississippi River in Trempealeau County (including Trempealeau Lakes Fishery Area).

Southern Mesic Forest

Southern Mesic Forests lie within deep, shady coves and ravines and on north-facing slopes and contain high amounts of sugar maple (*Acer saccharum*) and basswood. Deep shade created by dense canopy cover results in a very open understory and an abundant spring ephemeral display. On most Driftless Area Study Streams sites where Southern Mesic Forest occurs, gooseberries (*Ribes* spp.) are common, which is indicative of past grazing. Characteristic herbs are spring-beauty (*Claytonia virginica*), trout-lilies (*Erythronium* spp.), trilliums (*Trillium* spp.), violets (*Viola* spp.), bloodroot (*Sanguinaria canadensis*), blue cohosh (*Caulophyllum thalictroides*), mayapple (*Podophyllum peltatum*), and Virginia waterleaf (*Hydrophyllum virginianum*). Although large and intact examples of Southern Mesic Forest are rare in Wisconsin, a number of good examples occur within the Driftless Area Study Streams study area: at Coon Creek Fishery Area and Coon Creek Cliffs SNA in Vernon County, La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County, Eureka Maple Woods & Portland Maples SNA in Monroe County, Snow Bottom SNA in Grant County, Pinnacle Rock Rearing Station in Monroe County, and REM-Milanchthon Creek in Richland County.



Mature Southern Mesic Forest at Eureka Maple Woods SNA. Photo by Ryan O'Connor.

Southern Dry Forest, Southern Dry-mesic Forest

Southern Dry- and Dry-mesic Forests are common throughout the study area, and typically occur on south- and west-facing slopes of hills or on thin soiled hilltops and ridges; dry forests often occupy the upper, drier slopes while dry-mesic species occupy the lower slopes where slightly deeper soils and/or cooler, moister conditions prevail. Southern Dry Forest canopy dominants are white oak (*Quercus alba*) and black oak (*Quercus velutina*), with admixtures of red and bur oak (*Q. rubra* and *Q. macrocarpa*) and black cherry (*Prunus serotina*). Southern Dry-mesic Forest canopy dominants are red oak, white oak, shagbark hickory (*Carya ovata*) and basswood. Ground layer species for both dry and dry-mesic forests overlap, and include wild geranium (*Geranium maculatum*), false Solomon's-seal (*Maianthemum racemosum*), hog-peanut (*Amphicarpaea bracteata*), and woodland sunflower (*Helianthus strumosus*). Abundant brambles (*Rubus* spp.), gray dogwood (*Cornus racemosa*), and American hazelnut (*Corylus americana*) occupy a robust shrub layer in dry forests but are much less pronounced in the dry-mesic forest where deeper shade and less frequent fire reduces their growth.

While most of the dry and dry-mesic forests of the study area are still in the early stages of recovering from past logging, large canopy oaks still remain in many areas. The continuing invasion of shade-tolerant trees in the absence of regular fire has resulted in a cascade of environmental, compositional, and structural changes in these forests: As the subcanopy and canopy become more closed, deeper shade, higher soil moisture, and cooler microclimate ensue, creating a positive feedback cycle that progressively favors mesophytic species and disfavors shade-intolerant, fire-adapted species (Nowacki and Abrams 2008). In many areas, evidence of sustained and often heavy past grazing is apparent in the dominance of shrubs such as prickly ash (*Zanthoxylum americanum*) and multiflora rose (*Rosa multiflora*). Non-native invasive species such as non-native bush honeysuckle (*Lonicera* spp.) and garlic mustard (*Alliaria petiolata*) are also common in these forests. Good-quality examples of Southern Dry and Dry-mesic Forest have survived at Coon Creek Fishery Area in Vernon County, La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County, Hulbert Creek Woods SNA in Sauk County, Rush Creek SNA in Crawford County, Snow Bottom SNA and Mount Hope Rearing Station in Grant County, and Big Spring Creek, Love Creek and Trout Creek Fishery Areas in Iowa County.

Northern Dry and Dry-mesic Forest

Within the study area, Northern Dry and Dry-mesic Forest occur primarily where the Tension Zone passes through southwestern Chippewa County (e.g., Elk Creek Fishery Area), northern and eastern Jackson county (e.g., Buffalo River and Tank Creek Fishery Areas), and northern Monroe County (e.g., Sand Creek Pines SNA, Big Creek Fishery Area). These forests usually occur on sandy loams, sands or sometimes rocky soils. Dominant trees of Northern Dry Forest in the study area include jack and red pine (*Pinus banksiana* and *P. resinosa*), white oak, bur oak, and Hill's oak (*Quercus ellipsoidalis*). Northern Dry-mesic Forest is dominated by white pine (*Pinus strobus*) and red pine, red oak, and red maple (*Acer rubrum*). Common understory shrubs for both Northern Dry and Dry-mesic Forests are hazelnuts (*Corylus* spp.) and early low blueberry (*Vaccinium angustifolium*). Due to their location within the Tension Zone, ground layer species can be a mixture of both northern and southern forest species. Most examples of these community types within the study area are in the early stages of recovering from past logging and grazing. Good quality examples of Northern Dry-mesic Forest occur at Sand Creek Pines SNA in Monroe County and Hulbert Creek Woods SNA in Sauk County.

Oak Opening and Oak Woodland

Oak Opening and Oak Woodland are two fire-dependent savanna communities with scattered oaks as the dominant canopy tree and a variety of species growing underneath and between them. Oak Openings, as defined by Curtis (1959), have more than one tree per acre and less than 50% tree canopy coverage. Bur, white, and black oaks are dominant in mature stands, typically as large, open-grown trees with wide,

horizontally spreading crowns over short, thick boles. Shagbark hickory, red oak, hackberry (*Celtis occidentalis*) and black cherry are also sometimes present. American hazelnut is a common understory shrub. Under and between the oaks grow a mixture of sun-loving prairie plants, shade-loving woodland plants, and true savanna plants that prefer dappled sunlight. In contrast, Oak Woodland occupies a position on the vegetation continuum that is intermediate between Oak Opening and Southern Dry/Dry-mesic Forest, with canopy closures ranging from 50-95% (Richard Henderson, personal communication). The dominant tree of the Oak Woodland is the white oak, with lesser amounts of bur oak and black oak, and sometimes red oak, shagbark hickory, hackberry and black cherry. The diverse herb layer includes some members of the prairie, oak opening, and oak forest communities, but also features many grasses, sedges, legumes, composites and other forbs that are best adapted to the highly-filtered shade of the oak woodland.

Of all community types in the Driftless Areas Streams study area, Oak Opening and Oak Woodland are among the most frequently encountered. With the cessation of regular fire beginning in the 19th century, these oak savannas were rapidly invaded by native trees (especially later successional species such as maples) and shrubs. The resulting deeper shade conditions promoted a groundlayer composition that was more typical of forests, causing declines in savanna groundlayer species, and limiting if not completely preventing oak reproduction. Grazing and invasion of non-native trees and shrubs further exacerbated these negative impacts. Although no high-quality Oak Opening or Oak Woodland sites were detected in the study area during surveys, some sites harbored examples of oak savanna with high restoration potential, including Trout Creek and Big Spring Creek Fishery Areas in Iowa County, Snow Bottom SNA in Grant County, Rush Creek SNA and Fishery Area in Crawford County, Hulbert Creek Woods SNA in Sauk County, Trump Coulee Rearing Station in Jackson County, and La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County.

Oak Barrens and Pine Barrens

Black oak is the dominant tree in this fire-adapted savanna community of dry, sandy sites, although white oak, bur oak, Hill's oak, and occasionally red oak may also be present. Common ground layer species include typical prairie associates such as lead plant (*Amorpha canescens*), goat's-rue (*Tephrosia virginiana*), June grass (*Koeleria macrantha*), little bluestem (*Schizachyrium scoparium*), flowering spurge (*Euphorbia corollata*), frostweed (*Helianthemum* spp.), and wild lupine (*Lupinus perennis*). Heath species such as bracken fern, blueberries, bearberry, and sweet fern can also grow in patches of some Oak Barrens, and even achieve dominance. Pine Barrens are characterized by scattered pines (typically jack pines) which are often mixed with Hill's and bur oaks. Shrubs such as hazelnuts, (*Corylus* spp.) and prairie willow (*Salix humilis*), along with Sand Prairie herbs, occupy sunny openings. In both barrens communities, frequent fires can reduce the oaks to short, multi-stemmed "grubs." In areas that experience less frequent fires, large oaks may be present. Sites with Oak Barrens that have high restoration potential can be found at Trout Creek Fishery Area in Iowa County, and Tank Creek Fishery Area in Jackson County. La Crosse River Fishery Area in Monroe County harbors good restoration potential for Pine Barrens.

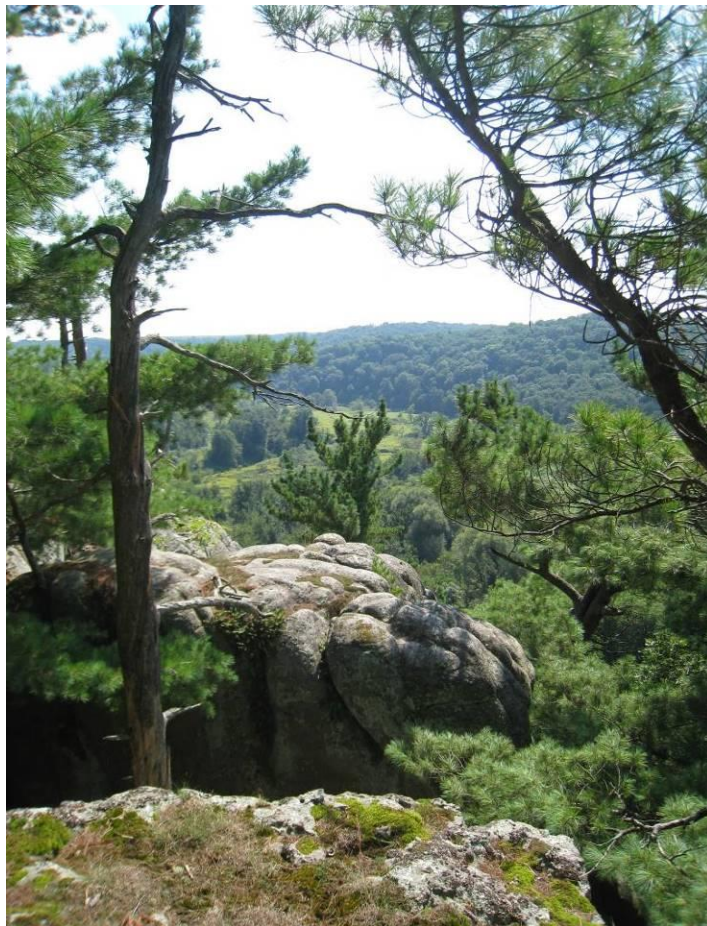
Cliff Communities

The greatest number of cliff communities in Wisconsin is found in the Driftless Area and is associated mostly with outcrops of dolomite and sandstone. Cliff communities present environmental conditions that are unique on the landscape, allowing only specialized plants to grow. In fact, a great number of endemic or rare species are associated with cliff communities. Three communities associated with cliffs are found within the study area: Dry Cliff, Moist Cliff, and Pine Relict.

Dry Cliff is the most commonly represented cliff community in the study area. The most characteristic plants of Dry Cliff are ferns (especially common polypody [*Polypodium vulgare*] and rusty woodsia [*Woodsia ilvensis*]), columbine (*Aquilegia canadensis*), harebell (*Campanula rotundifolia*), pale corydalis (*Corydalis sempervirens*), juneberry (*Amelanchier* spp.), northern bush-honeysuckle (*Diervilla lonicera*), and rock spikemoss (*Selaginella rupestris*). Good examples of Dry Cliff occur at Coon Creek Fishery Area in Monroe and Vernon Counties and Castle Rock Creek in Grant County.

Pine Relicts are found somewhat frequently on Driftless Area Study Streams properties. These isolated stands of white pine and red pine or, less commonly, jack pine, occur on sandstone outcrops or on thin soils over sandstone. Ground layer species are often more typical of northern communities, and include blueberries (*Vaccinium* spp.), huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*), pipsissewa (*Chimaphila umbellata*), and partridge-berry (*Mitchella repens*). Herbs typically found in southern Wisconsin's dry oak forests and prairies may also be found here. Good examples of Pine Relict are found at Castle Rock Creek and Snow Bottom SNA in Grant County.

Moist Cliff is less common in the study area, and is cool, moist, and shaded (by trees or by the cliff itself due to aspect). Common species are columbine, fragile ferns (*Cystopteris bulbifera* and *C. fragilis*), wood ferns (*Dryopteris* spp.), rattlesnake-root (*Prenanthes alba*), and wild sarsaparilla (*Aralia nudicaulis*). Good examples of Moist Cliff occur at Coon Creek Fishery Area in Vernon County, at La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County, at Snow Bottom SNA in Grant County, and at La Valle Mill Pond on the Baraboo River in Sauk County.



Pine Relict at Snow Bottom SNA.
Photo by Ryan O'Connor.

Minor Natural Communities and Other Vegetative Cover Types

Algific Talus Slope

This rare community consists of steep slopes of fractured limestone (dolomite) rock that retains ice and emits cold air throughout the growing season. The cold microhabitats enable the persistence of northern species and "periglacial relicts" such as northern wild monkshood (*Aconitum noveboracense*) and rare terrestrial snails. The woody overstory is often sparse, with scattered small black ash (*Fraxinus nigra*) and paper birch (*Betula papyrifera*). Mountain maple (*Acer spicatum*), a northern shrub, may be frequent, and extensive beds of bulblet fern (*Cystopteris bulbifera*) and mosses are characteristic. Only one Driftless Area Study Streams site is known to harbor Algific Talus Slope: Coon Creek Fishery Area in Monroe County, a highly significant site in that it is the only Algific Talus Slope known outside of Grant County.

Emergent Aquatic

These open communities occur where there is permanent standing water, and are dominated by robust plants that emerge from the water. The most common emergents are cat-tails (*Typha* spp.), bulrushes (particularly *Scirpus fluviatilis* and *S. validus*), bur-reeds (*Sparganium* spp.), water-plantains (*Alisma* spp.), and arrowheads (*Sagittaria* spp.). Good examples of Emergent Aquatic communities may be found along Bear Creek in Richland and Sauk Counties and at Willow Creek Fishery Area in Richland County.

Upland Prairie

Upland prairie remnants occur in the study area on shallow rocky soils, often on steep south- and west-facing slopes (Dry and Dry-mesic Prairie), and on sandy soils on level or gently rolling terrain (Sand Prairie). A general definition of "prairie" is an open grassland with less than one tree per acre (typically bur oak) (Curtis 1959). Prairies are dominated, in terms of biomass, by grasses, but in terms of species diversity, the wildflowers, or "forbs," capture the majority – 90% or more. Small shrubs such as wild roses (*Rosa* spp.), New Jersey tea (*Ceanothus americana*), American hazelnut, and leadplant complete the compositional picture. Some indicator species for Dry Prairie include little bluestem, side-oats grama (*Bouteloua curtipendula*), American pasqueflower (*Anemone patens*) and old field goldenrod (*Solidago nemoralis*). For Dry-mesic Prairie, some indicator species are prairie drop-seed (*Sporobolus heterolepis*), needle grass (*Stipa spartea*), Leonard's skullcap (*Scutellaria leonardii*) and western sunflower (*Helianthus occidentalis*). Typical Sand Prairie associates include hairy panic grass (*Dicanthelium acuminatum*), hairy hawkweed (*Hieracium longipilum*), goat's rue and long-branch frostweed (*Helianthemum canadense*). Virtually all remnants in the study area are small and generally highly degraded due to past grazing, fire suppression, and invasion of woody and non-native species. Good-quality Dry-mesic Prairie can be found at Buffalo River Trail Prairies SNA. High-quality examples of Dry Prairie occur at Rush Creek SNA in Crawford County.



Sand milkweed (*Asclepias amplexicaulis*) at La Crosse River Fishery Area. Photo by Kathy Kirk.

White Pine-Red Maple Swamp

This swamp community is restricted to the margins of the bed of extinct glacial Lake Wisconsin in the central part of the state. It often occurs along headwater streams and seepages in gently sloping areas. White pine and red maple are the dominant trees, with other species, including yellow birch (*Betula alleghaniensis*) present in lesser amounts. Common understory shrubs are speckled alder (*Alnus incana*) and winterberry holly (*Ilex verticillata*). Characteristic herbs include skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmunda cinnamomea*), and gold thread (*Coptis trifolia*). Sphagnum and other mosses are common. Only two examples of this community type were noted by surveyors, and they were low- to moderate-quality: one at Lowes Creek in Eau Claire County and one at Tank Creek Fishery Area in Jackson County.

Surrogate Grassland

Surrogate grasslands include agricultural habitats such as hayfields, small grains, row crops, fallow fields, old fields, pastures, fields planted to non-native cool-season grasses or native warm-season grasses, and prairie plantings. These are occasionally found in the study area on cleared bluff tops, valley bottoms, and sand terraces.

Pine Plantation

Pine plantations are relatively common throughout the study area.

Rare Species and High Quality Natural Communities

Rare species and high-quality examples of native communities have been documented within the Driftless Area Study Streams property group. Table 4 shows the rare species and high-quality natural communities currently known from Driftless Area Study Streams. Appendix C shows the rare species and high-quality natural communities currently known from Driftless Area Study Streams listed by region. See Appendix D for narrative descriptions of the species and natural communities mentioned in this report.

Table 5. Documented rare species and high-quality natural communities of Driftless Area Study Streams.

For explanation of state and global ranks, and state status, see Appendix F. State status, tracking status, and ranks based on June 1, 2011 working list.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Birds								
Acadian Flycatcher	<i>Empidonax virescens</i>	2011	S3B	G5	THR		X	Y
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2010	S4B,S4N	G5	SC/P		X	Y
Bell's Vireo	<i>Vireo bellii</i>	2002	S2B	G5	THR		X	Y
Black Tern	<i>Chlidonias niger</i>	2010	S2B	G4	SC/M		X	Y
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	2010	S3S4B	G5	SC/M		X	W
Blue-winged Warbler	<i>Vermivora cyanoptera</i>	2011	S4B	G5	SC/M		X	W
Bobolink	<i>Dolichonyx oryzivorus</i>	2000	S3S4B	G5	SC/M		X	W
Cerulean Warbler	<i>Dendroica cerulea</i>	2010	S2S3B	G4	THR		X	Y
Eastern Meadowlark	<i>Sturnella magna</i>	2000	S3S4B	G5	SC		X	W
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	2010	S3S4B	G4	SC/M		X	W
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	2010	S3B	G5	SC/M		X	W
Henslow's Sparrow	<i>Ammodramus henslowii</i>	2010	S2S3B	G4	THR		X	Y
Hooded Warbler	<i>Wilsonia citrina</i>	2011	S2S3B	G5	THR		X	Y
Kentucky Warbler	<i>Oporornis formosus</i>	2011	S1S2?B	G5	THR		X	Y
Lark Sparrow	<i>Chondestes grammacus</i>	2010	S3B	G5	SC/M		X	Y
Least Flycatcher	<i>Empidonax minimus</i>	2011	S4B	G5	SC/M		X	W
Louisiana Waterthrush	<i>Seiurus motacilla</i>	2011	S3B	G5	SC/M		X	Y
Northern Harrier	<i>Circus cyaneus</i>	2000	S3B, S2N	G5	SC/M		X	W
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	1990	S3B	G4	SC/M		X	W
Red-shouldered Hawk	<i>Buteo lineatus</i>	2010	S3S4B,S1N	G5	THR		X	Y
Veery	<i>Catharus fuscescens</i>	2011	S3S4B	G5	SC/M		X	W
Vesper Sparrow	<i>Poocetes gramineus</i>	2010	S3S4B	G5	SC/M		X	W
Willow Flycatcher	<i>Empidonax traillii</i>	2011	S4B	G5	SC/M		X	W
Wood Thrush	<i>Hylocichla mustelina</i>	2011	S4B	G5	SC/M		X	W
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2011	S3B	G5	SC/M		X	W
Fish								
American Eel	<i>Anguilla rostrata</i>	2009	S2	G4	SC/N		X	Y
Black Buffalo	<i>Ictiobus niger</i>	1998	S2	G5	THR		X	Y
Black Redhorse	<i>Moxostoma duquesnei</i>	1928	S1	G5	END		X	Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Blue Sucker	<i>Cycleptus elongatus</i>	2010	S2	G3G4	THR		X	Y
Goldeye	<i>Hiodon alosoides</i>	2009	S2	G5	END		X	Y
Greater Redhorse	<i>Moxostoma valenciennesi</i>	2009	S3	G4	THR		X	Y
Lake Sturgeon	<i>Acipenser fulvescens</i>	1998	S3	G3G4	SC/H		X	Y
Mud Darter	<i>Etheostoma asprigene</i>	2010	S3	G4G5	SC/N			Y
Ozark Minnow	<i>Notropis nubilus</i>	2010	S2	G5	THR		X	Y
Paddlefish	<i>Polyodon spathula</i>	2010	S2	G4	THR		X	Y
Pallid Shiner	<i>Notropis amnis</i>	2003	S1	G4	END		X	Y
Pirate Perch	<i>Aphredoderus sayanus</i>	2009	S3	G5	SC/N			Y
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	2006	S3	G5	SC/N			Y
Redfin Shiner	<i>Lythrurus umbratilis</i>	1976	S2	G5	THR		X	Y
Redside Dace	<i>Clinostomus elongatus</i>	1979	S3	G4	SC/N			W
River Redhorse	<i>Moxostoma carinatum</i>	2010	S2	G4	THR		X	Y
Shoal Chub	<i>Macrhybopsis aestivalis</i>	1998	S2	G5	THR		X	Y
Silver Chub	<i>Macrhybopsis storeriana</i>	2006	S3	G5	SC/N			Y
Skipjack Herring	<i>Alosa chrysochloris</i>	1993	S1	G5	END		X	Y
Starhead Topminnow	<i>Fundulus dispar</i>	2010	S2	G4	END		X	Y
Weed Shiner	<i>Notropis texanus</i>	2008	S3	G5	SC/N			Y
Western Sand Darter	<i>Ammocrypta clara</i>	2010	S3	G3	SC/N		X	Y
Mammals								
Big Brown Bat	<i>Eptesicus fuscus</i>	2010	S2S4	G5	THR			Y
Deer Mouse	<i>Peromyscus maniculatus</i>	2011	S4	G5	SC/N		X	W
Eastern Pipistrelle ³	<i>Perimyotis subflavus</i>	2011	S1S3	G5	THR			Y
Eastern Red Bat	<i>Lasiurus borealis</i>	2011	S3	G5	SC/N		X	W
Gray Wolf	<i>Canis lupus</i>	2008	S4	G4	SC/P		X	Y
Hoary Bat	<i>Lasiurus cinereus</i>	2011	S3	G5	SC/N		X	W
Little Brown Bat ³	<i>Myotis lucifugus</i>	2011	S2S4	G5	THR			Y
Northern Long-eared Bat ³	<i>Myotis septentrionalis</i>	2011	S1S3	G4	THR		X	Y
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	2011	S2S4	G5	SC/N		X	W
Water Shrew	<i>Sorex palustris</i>	2011	S3	G5	SC/N		X	Y
Woodland Vole	<i>Microtus pinetorum</i>	1944	S2	G5	SC/N		X	Y

³ This record did not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Amphibians								
American Bullfrog	<i>Lithobates catesbeianus</i>	2010	S3S4	G5	SC/H			W
Four-toed Salamander	<i>Hemidactylium scutatum</i>	1928	S3?	G5	SC/H		X	W
Northern Cricket Frog	<i>Acris crepitans</i>	2011	S1	G5	END		X	Y
Northern Leopard Frog	<i>Lithobates pipiens</i>	2011	S4?	G5	SC/H			W
Pickerel Frog	<i>Lithobates palustris</i>	2011	S3?	G5	SC/H		X	Y
Reptiles								
Blanding's Turtle	<i>Emydoidea blandingii</i>	2010	S3S4	G4	THR		X	Y
Gophersnake	<i>Pituophis catenifer</i>	2009	S2S3	G5	SC/P		X	Y
Gray Ratsnake	<i>Pantherophis spiloides</i>	2003	S3	G5T5	SC/P		X	Y
Ornate Box Turtle	<i>Terrapene ornata</i>	1974	S1	G5	END		X	Y
Plains Gartersnake	<i>Thamnophis radix</i>	2011	S2?	G5	SC/H			Y
Slender Glass Lizard	<i>Ophisaurus attenuatus</i>	2008	S1	G5	END		X	Y
Timber Rattlesnake	<i>Crotalus horridus</i>	2009	S2S3	G4	SC/P		X	Y
Wood Turtle	<i>Glyptemys insculpta</i>	2011	S2	G4	THR		X	Y
Terrestrial Snails								
Bristled Slitmouth	<i>Stenotrema barbatum</i>	2011	S3	G5	SC/N			W
Broad-banded Forestsnail	<i>Allogona profunda</i>	2011	S2S3	G5	SC/N			Y
Cherrystone Drop	<i>Hendersonia occulta</i>	2011	S2S3	G4	THR		X	Y
Domed Disc	<i>Discus patulus</i>	2011	SU	G5	SC/N			Y
Ribbed Striate	<i>Striatura exigua</i>	2011	S2S3	G5	SC/N			Y
Smooth Coil	<i>Helicodiscus singleyanus</i>	1987	S2?	G5	SC/N			Y
Dull Gloss	<i>Zonitoides limatulus</i>	2011	S1S2	G4G5	SC/N		X	Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Mussels⁴								
Buckhorn	<i>Tritogonia verrucosa</i>	1932	S2	G4G5	THR		X	Y
Butterfly	<i>Ellipsaria lineolata</i>	1931	S2	G4G5	END		X	Y
Elephant Ear	<i>Elliptio crassidens</i>	1934	S1	G5	END		X	Y
Fawnsfoot	<i>Truncilla donaciformis</i>	2005	S1S2	G5	SC/P		X	Y
Higgins' Eye	<i>Lampsilis higginsii</i>	2005	S1	G1	END	LE	X	Y
Monkeyface	<i>Quadrula metanevra</i>	1981	S2	G4	THR		X	Y
Rock Pocketbook	<i>Arcidens confragosus</i>	1982	S1S2	G4	THR		X	Y
Wartyback	<i>Quadrula nodulata</i>	1979	S1S2	G4	THR		X	Y
Washboard	<i>Megaloniaias nervosa</i>	1979	S3	G5	SC/P			Y
Yellow & Slough Sandshells	<i>Lampsilis teres</i>	1931	S1	G5	END		X	Y
Stoneflies								
Quadrate Sallfly	<i>Haploperla orpha</i>	1995	S2S3	G4	SC/N		X	Y
Dragonflies and Damselflies								
Clamp-tipped Emerald	<i>Somatochlora tenebrosa</i>	2011	S1S2	G5	SC/N		X	Y
Cyrano Darner	<i>Nasiaeschna pentacantha</i>	1964	S3S4	G5	SC/N			W
Russet-tipped Clubtail	<i>Stylurus plagiatus</i>	1992	S3S4	G5	SC/N			W
Sand Snaketail	<i>Ophiogomphus smithi</i>	2002	S2	G2G3	SC/N		X	Y
Slender Bluet	<i>Enallagma traviatum</i>	2010	S1S3	G5	SC/N		X	Y
Smoky Shadowfly	<i>Neurocordulia molesta</i>	1997	S3	G4	SC/N			W
Caddisflies								
A Lepidostomatid Caddisfly	<i>Lepidostoma libum</i>	2011	S2S3	G3G4	SC/N		X	Y
A Rhyacophilan Caddisfly	<i>Rhyacophila vibox</i>	2011	S4	G5	SC/N		X	W
Mayflies								
A Spiny Crawler Mayfly	<i>Ephemerella excrucians</i>	2011	S5	G5	SC/N		X	W
Aquatic Beetles								
A Predaceous Diving Beetle	<i>Agabus confinis</i>	2011	S3	GNR	SC/N		X	W
A Predaceous Diving Beetle	<i>Hydroporus pseudovilis</i>	2011	S2S3	GNR	SC/N		X	Y
A Water Scavenger Beetle	<i>Cymbiodyta blanchardi</i>	2011	S2S3	GNR	SC/N		X	W
A Water Scavenger Beetle	<i>Cymbiodyta chamberlaini</i>	2011	S3	GNR	SC/N		X	W
A Water Scavenger Beetle	<i>Hydrochara spangleri</i>	2011	S3S4	GNR	SC/N		X	W

⁴ All mussel species occur in the Mississippi River.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
A Water Scavenger Beetle	<i>Sperchopsis tessellatus</i>	2011	S3S4	GNR	SC/N		X	W
A Water Scavenger Beetle	<i>Hydrobius melaenum</i>	2011	S4	GNR	SC/N		X	W
Miscellaneous Elements								
Bat Hibernaculum	Bat Hibernaculum		S3	GNR	SC			Y
Bird Rookery	Bird Rookery	1994	SU	G5	SC			Y
Herp Hibernaculum	Herp Hibernaculum	2008	SU	GNR	SC			Y
Karner Blue Federal High Potential Range	Karner Blue Federal High Potential Range	2012	SNR	GNR	NA			Y
Plants								
American Fever-few	<i>Parthenium integrifolium</i>	1987	S3S4	G5	THR			Y
American ginseng	<i>Panax quinquefolius</i>	2010	S4	G3G4	SC			W
Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	1901	S2	G5	SC			Y
Butternut	<i>Juglans cinerea</i>	2011	S3?	G4	SC			W
Canada Yew	<i>Taxus canadensis</i>	2010	S4	G5	SC			W
Carolina Anemone	<i>Anemone caroliniana</i>	1888	S1	G5	END			Y
Clustered Poppy-mallow	<i>Callirhoe triangulata</i>	1861	S2	G3	SC			Y
Clustered Sedge	<i>Carex cumulata</i>	1968	S2	G4?	SC			Y
Dwarf Milkweed	<i>Asclepias ovalifolia</i>	2010	S3	G5?	THR			Y
Flat-stemmed Spike-rush	<i>Eleocharis compressa</i>	1884	S2	G4	SC			Y
Glade Fern	<i>Diplazium pycnocarpon</i>	2010	S2	G5	SC			Y
Glade Mallow	<i>Napaea dioica</i>	2011	S3	G4	SC			W
Great Indian-plantain	<i>Cacalia muehlenbergii</i>	2011	S3	G4	SC			W
Great Water-leaf	<i>Hydrophyllum appendiculatum</i>	2011	S2S3	G5	SC			Y
Hooker's Orchid	<i>Platanthera hookeri</i>	1884	S2	G4	SC			Y
Lobed Spleenwort	<i>Asplenium pinnatifidum</i>	1990	S1	G4	THR			Y
Low Calamint	<i>Calamintha arkansana</i>	1911	S2	G5	SC			Y
Musk-root	<i>Adoxa moschatellina</i>	1936	S2	G5	THR			Y
Narrow-leaved Dayflower	<i>Commelina erecta</i> var. <i>deamiana</i>	1884	S1	G5T5	SC			Y
Northern Wild Monkshood	<i>Aconitum noveboracense</i>	2008	S2	G3	THR	LT		Y
One-flowered Broomrape	<i>Orobanche uniflora</i>	1931	S3	G5	SC			Y
Pale False Foxglove	<i>Agalinis skinneriana</i>		S2	G3G4	END			Y
Pale Green Orchid	<i>Platanthera flava</i> var. <i>herbiola</i>	1928	S2	G4T4Q	THR			Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Pin Oak	<i>Quercus palustris</i>	1993	S1	G5	SC			Y
Pink Milkwort	<i>Polygala incarnata</i>	1914	S1	G5	END			Y
Prairie False-dandelion	<i>Nothocalais cuspidata</i>	1886	S2	G5	SC			Y
Prairie Fame-flower	<i>Phemeranthus rugospermus</i>	1991	S3	G3G4	SC			Y
Prairie Indian-Plantain	<i>Cacalia tuberosa</i>	1968	S3	G4G5	THR			Y
Prairie Parsley	<i>Polytaenia nuttallii</i>	1987	S2	G5	THR			Y
Prairie Ragwort	<i>Senecio plattensis</i>	1959	S3	G5	SC			Y
Prairie Turnip	<i>Pedimelum esculentum</i>	1989	S3	G5	SC			Y
Purple Milkweed	<i>Asclepias purpurascens</i>	1931	S3	G5?	END			Y
Rock Clubmoss	<i>Huperzia porophila</i>	1980	S3	G4	SC			Y
Rock Stitchwort	<i>Arenaria stricta ssp. dawsonensis</i>	1958	S1	G5	SC			Y
Roundstem Foxglove	<i>Agalinis gattereri</i>	2011	S2	G4	THR			Y
Shadowy Goldenrod	<i>Solidago sciaphila</i>	2010	S4	G3G4	SC			W
Short's Rock-cress	<i>Arabis shortii</i>	2011	S1S2	G5	SC			Y
Silky Prairie-clover	<i>Dalea villosa var. villosa</i>	1958	S2	G5	SC			Y
Small Forget-me-not	<i>Myosotis laxa</i>	1932	S2	G5	SC			Y
Small White Lady's-slipper	<i>Cypripedium candidum</i>	1886	S3	G4	THR			Y
Smooth-sheath Sedge	<i>Carex laevivaginata</i>	1989	S1	G5	END			Y
Snowy Campion	<i>Silene nivea</i>	2011	S2	G4?	THR			Y
Twinleaf	<i>Jeffersonia diphylla</i>	2011	S3	G5	SC			Y
Violet Bush-clover	<i>Lespedeza violacea</i>	1970	S2	G5	SC			Y
Whip Nutrush	<i>Scleria triglomerata</i>	1932	S2S3	G5	SC			Y
Wild Hyacinth	<i>Camassia scilloides</i>	1995	S2	G4G5	END			Y
Wild Licorice	<i>Glycyrrhiza lepidota</i>	1910	S1	G5	SC			Y
Woodland Bluegrass	<i>Poa sylvestris</i>	2011	S1	G5	SC			Y
Woolly Milkweed	<i>Asclepias lanuginosa</i>	1998	S1	G4?	THR			Y
Yellow Gentian	<i>Gentiana alba</i>	2002	S4	G4	THR			Y
Yellow Giant Hyssop	<i>Agastache nepetoides</i>	1993	S3	G5	THR			Y
Yellow Wild-indigo	<i>Baptisia tinctoria</i>	1986	S1	G5	SC			Y
Natural Communities								
Algific Talus Slope	Algific talus slope	2010	S1	G2	NA			Y
Cedar Glade	Cedar glade	1984	S4	GNR	NA			Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Dry Cliff	Dry cliff	2010	S4	G4G5	NA			Y
Dry Prairie	Dry prairie	1981	S3	G3	NA			Y
Emergent Marsh	Emergent marsh	1986	S4	G4	NA			Y
Floodplain Forest	Floodplain forest	2006	S3	G3?	NA			Y
Hemlock Relict	Hemlock relict	1976	S2	G2Q	NA			Y
Moist Cliff	Moist cliff	2011	S4	GNR	NA			Y
Northern Dry-mesic Forest	Northern dry-mesic forest	2010	S3	G4	NA			Y
Oak Barrens	Oak barrens	2010	S2	G2?	NA			Y
Pine Barrens	Pine barrens	1998	S2	G2	NA			Y
Pine Relict	Pine relict	2011	S2	G4	NA			Y
Riverine Lake/Pond	Riverine Lake/Pond	1981	SU	GNR	NA			Y
Shrub-carr	Shrub-carr	1976	S4	G5	NA			Y
Southern Dry Forest	Southern dry forest	2011	S3	G4	NA			Y
Southern Dry-mesic Forest	Southern dry-mesic forest	2011	S3	G4	NA			Y
Southern Mesic Forest	Southern mesic forest	2011	S3	G3?	NA			Y
Southern Sedge Meadow	Southern sedge meadow	2010	S3	G4?	NA			Y
Stream--Fast, Hard, Cold	Stream--fast, hard, cold	1984	S4	GNR	NA			Y
Stream--Fast, Soft, Cold	Stream--fast, soft, cold	1981	SU	GNR	NA			Y
Stream--Slow, Hard, Cold	Stream--slow, hard, cold	1969	SU	GNR	NA			Y
Stream--Slow, Soft, Cold	Stream--slow, soft, cold	1982	SU	GNR	NA			Y

Management Opportunities and Considerations for Biodiversity Conservation

Landscape Level Opportunities and Considerations

Wildlife Action Plan Conservation Opportunity Areas (COAs)

The Wisconsin Wildlife Action Plan (WDNR 2006a) identified multiple COAs in the Western Coulee and Ridges and Southwest Savanna Ecological Landscapes; Driftless Area Study Streams properties intersect 16 of them (See Appendix B for maps). They are listed below with a brief description. For more details on COAs and their designation in the Wildlife Action Plan, see the "Background on Past Efforts" section of this report or the WDNR Endangered Resources web pages.

Bur Oak Openings – Global Significance

Description: Driftless Area natural communities over sandstone influenced soils including a continuum of Sand Prairie, Oak Barrens, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Shrub-carr, and Dry Cliff.

COA(s): Ft. McCoy Barrens and Oak Savanna

Ecological Landscape(s): Western Coulee and Ridges

Driftless Area Features – Continental Significance

Description: Driftless Area natural communities over loess and sandstone influenced soils including a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub-carr, Dry Cliffs, and Moist Cliffs.

COA(s): Lower Kickapoo and Kickapoo; Coon Creek Mesic; Coulee Forests; Greensand Cuesta; Snow Bottom; Dodgeville and Wyoming Oak Woodland/Savanna; Rush Creek; and Millville-Sandy Creek.

Ecological Landscape(s): Western Coulee and Ridges

Large River Corridors – Continental Significance

Description: Large river systems including riparian communities including Warmwater Rivers, Floodplain Forest, Emergent Marsh, Submergent Aquatics, Wild Rice, and Impoundments. Also included in this feature are upland communities that range from bluff top to bluff top including Southern Dry Forest, Southern Dry-mesic Forest, Dry Prairie, Oak Woodland, Oak Opening and Dry Cliff.

COA(s): Lower Black River to Black River Falls Dam; Mississippi Bluffs & Floodplain; Lower Wisconsin Bluffs & Floodplain

Ecological Landscape(s): Western Coulee and Ridges

Medium-sized Rivers and Streams – Upper Midwest/Regional Significance

Description: Warmwater Rivers and streams including stream side communities including Floodplain Forest, Oak Opening, Oak Barrens, and Shrub-carr.

COA(s): Lower Baraboo River; Upper Hall's Creek.

Ecological Landscape(s): Western Coulee and Ridges

Diverse Aquatic Communities – State Significance

Description: Warmwater Stream systems featuring rare fish habitat.

COA(s): Little Platte River and Tributaries

Ecological Landscape(s): Western Coulee and Ridges and Southwest Savanna

Large Sedge Meadows, Fens and Prairies – Upper Midwest Significance

Description: Extensive grassland mostly surrogate, but also including proportionally large embedded patches of Dry Prairie, Dry-Mesic Prairie, Southern Sedge Meadow, Oak Opening, Oak Woodland, and Surrogate Grassland.

COA(s): Southwest Grasslands and Streams

Ecological Landscape(s): Southwest Savanna

Altered Ecological Processes

The vegetation that historically occurred on Driftless Area Study Streams properties developed within a complex environment comprised of both elements that are relatively static over ecological time (e.g., soils, underlying landforms) and dynamic (e.g., hydrological cycles, nutrient cycles, wildfires). Some of the dynamic ecological processes that shaped these landscapes have been altered by humans.

The hydrology of many of the streams and rivers in the study site were modified for various purposes: ditching and tiling for agriculture, installation of impoundments for fish rearing or waterfowl production, and installation of dams for flood control, agriculture, mill operations, etc. Significant restoration has been conducted in some areas to improve and restore both in-stream habitat as well as the adjacent stream corridor and immediate surrounding landscape (e.g., removal of small dams, resculpting stream banks, planting native prairie species on old agricultural fields in valleys, etc.). However, in many unrestored areas, the effects of past hydrologic modifications continue to negatively impact native plant communities and the species they support by either directly displacing them or by changing the moisture regime they need to survive. The negative impacts of dams and impoundments on animal communities are also well-documented and should be mitigated to the extent possible and practical. Dams affect aquatic species and habitats by fragmenting them into disjunct segments, preventing the movements of some species between different stretches of the water bodies. Water below impoundments is warmer and of diminished quality, negatively affecting the aquatic invertebrate communities, increasing the growth of periphyton, and diminishing the quality and quantity of fish habitat. Impoundments typically have organically rich bottom sediments, resulting in algal blooms and periods of dissolved oxygen depletion near the bottom.

Another ecological process that has been altered is how fire interacts with the natural communities and rare species of Driftless Area Study Streams properties. For virtually all of the natural communities (excluding moist cliffs, mesic forest, and aquatics), fire was a critical process in their development and in maintaining habitat for the species that depend on them. Without regular fire, native woody species can invade and dominate these communities. By volatilizing elevated soil nitrogen, fire also indirectly influences nutrient cycling, shifting conditions to generally favor native plants and to disfavor non-native invasive species. In woodlands, fire facilitates seedling establishment, controls tree species that are not adapted to fire, and prevents smothering of short-statured plants through the removal of leaf litter. In grasslands, fire promotes growth, flowering and overall diversity of native plants by removing excess thatch. Re-introducing fire into an area should be done with consideration of all of the species currently using the habitat and how the fire may impact the amount and quality of habitat available.

Non-Native Invasive Species

Many non-native terrestrial invasive plants, animals and pathogens are present on Driftless Area Study Streams properties and in the surrounding landscape. Non-native invasive species thrive in newly disturbed areas, but also may invade and compromise high-quality natural areas. They establish quickly, tolerate a wide range of conditions, are easily dispersed, and are free of the diseases, predators, and competitors that kept their populations in check in their native range.

In terrestrial settings, non-native invasive plants out-compete and even kill native plants by monopolizing light, water, and nutrients, by altering soil chemistry and, in the case of garlic mustard, by altering mycorrhizal relationships. In situations where non-native invasive plants become dominant, they may even alter ecological processes by limiting one's ability to use prescribed fire (a striking example being common buckthorn [*Rhamnus cathartica*]), by modifying hydrology (e.g., reed canary grass can alter surface flow and clog culverts), and by limiting tree regeneration and ultimately forest composition (WDNR In prep. b). In addition to the threats on native communities and native species diversity, terrestrial non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading fish and wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters).

Similar to terrestrial invasives, aquatic invasives are successful because they originate in other regions or continents, thus lacking natural checks and balances. Early and abundant growth of non-native aquatic plants not only overwhelms native plants, it may disrupt aquatic predator-prey relationships by fencing out larger fish and may limit important aquatic food plants for waterfowl. The die-off of plants such as curly-leaf pondweed in summer can cause oxygen depletion in waterbodies, and decaying plants can contribute to nutrient loading and algal blooms. Aquatic invasive animals similarly present overwhelming competition to their native counterparts (e.g., rusty crayfish [*Orconectes rusticus*] versus native crayfish). Invasive mussels, which feed on plants, animals and debris that are suspended in the water, can contribute to increased water clarity and light penetration (fostering overgrowth of rooted aquatic plants), as well as a depleted food supply for native aquatic organisms. Zebra mussels (*Dreissena polymorpha*) not only monopolize resources and alter the aquatic environment, they literally smother native mussels by attaching to their shells in great masses. Apart from environmental impacts, aquatic invasives diminish aquatic recreational resources by inhibiting boat and swimming access, and by negatively affecting game fish populations.

The primary usage of Driftless Area Study Streams for fishing and other forms of recreation has contributed to the introduction and spread of non-native invasive species throughout the properties. Parking areas, trails, and other high-use areas are typical entry points for non-native invasive species that are introduced by visitors' footwear, clothing, vehicle tires, boats, and recreational equipment. Once established, these invasives may continue to spread along natural corridors (e.g., waterways) and along human-made corridors (e.g., trails and roads). They even have the potential to invade remote high-quality natural areas via vectors such as wind, water, and wildlife. Non-native invasive species may also be spread inadvertently through management activities such as timber operations and roadside mowing, especially if Best Management Practices aren't followed.

Since the study area properties are so numerous and widespread, the following information is generalized to the larger Driftless Area landscape. Non-native invasive species that are abundant and/or widespread throughout the Driftless Area and pose the greatest immediate threat to native species diversity, rare species habitats, or high-quality natural communities of properties within the study area are listed in Table 5. Although resources for complete control of these widespread invasives may be lacking, containment (i.e., limiting further spread) may be considered as an alternative action.

Table 6. Abundant and/or widespread non-native invasive species of the Driftless Area

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic
		Open	Wooded	Open	Wooded	
Plant						
Autumn olive	<i>Eleagnus angustifolia</i>	X				
Canada thistle	<i>Cirsium arvense</i>	X	X	X		
Common buckthorn	<i>Rhamnus cathartica</i>	X	X	X	X	
Crown vetch	<i>Coronilla varia</i>	X				
Curly-leaf pondweed	<i>Potamogeton crispus</i>					X
Eurasian bush honeysuckles	<i>Lonicera</i> spp.	X	X			
Eurasian water milfoil	<i>Myriophyllum spicatum</i>					X
Garlic mustard	<i>Alliaria petiolata</i>		X		X	
Multiflora rose	<i>Rosa multiflora</i>	X	X			
Reed canary grass	<i>Phalaris arundinacea</i>			X	X	
Watercress	<i>Nasturtium officinalis</i>					X
White sweet clover	<i>Melilotus alba</i>	X				
Wild parsnip	<i>Pastinaca sativa</i>	X		X		
Yellow sweet clover	<i>Melilotus officinalis</i>	X				
Animal						
European earthworms	<i>Acanthodrilidae, Lumbricidae, and Megascloedidae</i>	X	X			
Fungus						
Oak wilt	<i>Ceratocystis fagacearum</i>		X		X	

Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010). A number of non-native invasive species are, in fact, moderate in abundance or are not yet widespread in the Driftless Area (Table 6), while others are just getting started in the region or show potential to invade the Driftless Area (Table 7); monitoring for these species and rapid response to small infestations represent high-impact actions.

Table 7. Moderate or not-widespread non-native invasive species of the Driftless Area

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic
		Open	Wooded	Open	Wooded	
Plant						
Amur honeysuckle	<i>Lonicera maackii</i>	X	X			
Black swallowwort	<i>Vincetoxicum nigrum</i>	X	X			
Blackberry lily	<i>Iris domestica</i>	X	X			
Celandine	<i>Chelidonium majus</i>		X			
Common tansy	<i>Tanacetum vulgare</i>	X				
Dame's rocket	<i>Hesperis matronalis</i>		X		X	
Japanese barberry	<i>Berberis thunbergii</i>		X			
Japanese hedgeparsley	<i>Torilis japonica</i>	X	X			
Japanese hops	<i>Humulus japonicus</i>	X		X	X	
Japanese knotweed	<i>Polygonum cuspidatum</i>	X	X	X	X	
Leafy spurge	<i>Euphorbia esula</i>	X				
Moneywort	<i>Lysimachia nummularia</i>			X	X	X
Narrow-leaved cattail	<i>Typha angustifolia</i>			X		
Oriental bittersweet	<i>Celastrus orbiculatus</i>	X	X			
Phragmites	<i>Phragmites australis</i>	X		X		
Poison hemlock	<i>Conium maculatum</i>	X		X		
Purple loosestrife	<i>Lythrum salicaria</i>			X		
Spotted knapweed	<i>Centaurea biebersteinii</i>	X				
Teasel spp.	<i>Dipsacus spp.</i>	X				
Wild chervil	<i>Anthriscus sylvestris</i>	X	X			
Animal						
Feral domestic swine	<i>Sus domestica</i>	X	X		X	
Quagga mussel	<i>Dreissena bugensis</i>					X
Rusty crayfish	<i>Orconectes rusticus</i>					X
Zebra mussel	<i>Dreissena polymorpha</i>					X
Fungus						
Annosum root rot	<i>Heterobasidion annosum</i>		X			



**Japanese hops found along Copper Creek in Crawford County.
Photo by Ryan O'Connor.**

Table 8. New or potential non-native invasive species of the Driftless Area

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic
		Open	Wooded	Open	Wooded	
Plant						
Brazilian waterweed	<i>Egeria densa</i>					X
Didymo	<i>Didymosphenia geminata</i>					X
Giant manna grass	<i>Glyceria maxima</i>			X	X	
Hydrilla	<i>Hydrilla verticillata</i>					X
Yellow floating heart	<i>Nymphoides peltata</i>					X
Water dropwort	<i>Oenanthe javonica</i>					X
Water hyacinth	<i>Eichhornia crassipes</i>					X
Water lettuce	<i>Pistia stratiotes</i>					X
Animal						
Asian clam	<i>Corbicula fluminea</i>					X
Asian crazy worm	<i>Amyntas</i> spp.	X	X			
Banded mystery snail	<i>Vivaparus georgianus</i>					X
Chinese mystery snail	<i>Cipangopaludina chinensis</i>					X
Emerald ash borer	<i>Agrilus planipennis</i>		X		X	
Faucet snail	<i>Bithynia tentaculata</i>					X
Japanese mystery snail	<i>Cipangopaludina japonica</i>					X
New Zealand mud snail	<i>Potamopyraus antipodarum</i>					X
Red swamp crayfish	<i>Procambarus clarkii</i>			?	?	X
Fungus & Other Pathogens						
Viral hemorrhagic septicemia						X

For recommendations on controlling specific invasive species consult with WDNR staff, refer to websites on invasive species, such as that maintained by the WDNR (search for "invasive species") and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups:

- Southwestern Wisconsin Weed Management Area (Grant, Crawford, Lafayette, Iowa, Richland, Dane, Sauk Counties). Contact: Mark Horn, (608)836-0054, mark.horn@monarda.biz.
- Greater Sauk Co. Invasive Plant Team - John Exo, UW Extension Basin Educator, john.exo@ces.uwex.edu, (608) 355-3554.
- Monroe Co. Invasive Plant Team, david.beckmann1@us.army.mil (608) 388-5374.

Also refer to invasive species Best Management Practices (BMPs) for forestry, recreation, urban forestry, and rights-of-way, which were developed by the Wisconsin Council on Forestry (<http://council.wisconsinforestry.org/>).

Following are details on a few key species:

Emerald Ash Borer

The emerald ash borer (*Agrilus planipennis*), a non-native invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008 and is now found in six counties. The beetle attacks all species of ash (*Fraxinus* spp.) in Wisconsin, and the risk to forests is high: Models predict that a healthy forest could lose 98% of its ash trees in six years (WDNR 2010a).

Oak Wilt

Oak wilt is caused by a fungus, *Ceratocystis fagacearum*, that effects water movement within oak trees, often killing the trees. The fungus was thought to be native, but the most recent science suggests that it is not (J. Cummings Carlson, WDNR, personal communication). It has been in the state for at least 100 years and is widespread throughout the southern part of the state. Oak wilt is often not a major concern for woodland or barrens restoration areas where open canopy conditions are favored, and dead oak trees can make long-lasting wildlife cavity trees. It can, however, have significant impacts to forested stands with a heavy oak component.

European Earthworms

The invasion of forests by European earthworms of the families *Acanthodrilidae*, *Lumbricidae*, and *Megascolecidae* is a concern throughout Wisconsin. While native earthworms were absent from much of Wisconsin after the last glaciation, non-native invasive earthworms have been introduced since widespread Euro-American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Non-native earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (Suárez et al. 2004, Bohlen et al. 2004), and fine-root biomass (Groffman et al. 2004). These physical changes in the forest floor reduce densities of tree seedlings and rare herbs (Gundale 2002) and can favor non-native invasive plants (Kourtev et al. 1999). In a study of 51 Northern Wisconsin forest stands, Wiegmann (2006) found that shifts in ground layer plant community composition due to non-native earthworms were more severe in stands with high white-tailed deer densities. Since European earthworms are primarily spread by discarded fishing bait, angler education and outreach is a critical strategy to help slow the spread.

Reed canary grass

Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. Hatch and Bernthal (2008) determined that approximately 500,000 acres of wetlands in Wisconsin are infested with reed canary grass. In addition to incurring devastating impacts on native plants and animals, reed canary grass can also alter hydrology by trapping silt and constricting waterways and reduce the carbon sequestration capacity of wetlands (Wisconsin Reed Canary Grass Management Working Group 2009). This species prefers disturbed areas but can also move into intact native wetlands. Invasion is most often associated with disturbances including erosion, ditching, stream channelization, logging of forested wetlands, and planting. Nutrient inputs such as sedimentation, fertilizer or agricultural runoff also encourage invasion and proliferation of reed canary grass.

Reed canary grass is extremely difficult to eradicate due to a number of factors: 1) A formidable seed bank may persist on a restoration site for many years; 2) A dense network of persistent rhizomes are difficult to eliminate; 3) Recolonization from proximal sites is likely, given the ubiquitous distribution of this species; and 4) Establishment of desirable native vegetation may be costly and difficult (especially in a riparian setting that is prone to flashy flooding). No single control method is universally applicable, and

in fact a combination of approaches applied over many years may be necessary. Each site has to be evaluated based on agricultural history, hydrological alteration, landscape context, and invasion pattern. Development of a comprehensive restoration plan is recommended to address not just reed canary grass control but also rapid re-establishment of desirable native vegetation and long-term monitoring.

A working group of Wisconsin natural resource professionals with experience in reed canary grass control have been meeting since the fall of 2005 to develop guidelines for the control of this invasive grass in Wisconsin wetlands. Their management guide is an excellent reference for land managers (Wisconsin Reed Canary Grass Management Working Group 2009), and includes information on how to set up a management plan using a combination of practices and timing of treatments that's tailored to specific site conditions, a table of available control techniques, and a listing of native plant species and seed mixes that will compete with reed canary grass. Additionally, the herbicide Sethoxydim is showing great promise for reed canary grass control in Wisconsin (Annen et al 2005, Annen 2008).

Climate Change

Climate change will have an impact on the natural resources of the Driftless Area, though understanding of these changes is a growing science. Some changes that may result from climate change include increases in both summer and winter minimum temperatures, shifts in seasonal precipitation (more in the winter, less in the summer), and more frequent extreme weather events such as very heavy rainstorms or heat waves (WICCI 2011). Results of these changes may include the shifting of species ranges: Species at the southern edge of their range in the Driftless Area (e.g., sugar maple, white pine, and jack pine) may diminish in the region, while species at the northern edge of their range (e.g., honey locust [*Gleditsia triacanthos*], Kentucky coffee-tree [*Gymnocladus dioica*], chinquapin oak [*Quercus muhlenbergii*], and sycamore [*Platanus occidentalis*]) may expand further northward. Natural communities of coulees, gorges, cliffs, and north-facing slopes (and the plants and animals associated with them) will also be vulnerable, as their very existence is founded in their exceptionally cool, moist microclimate; this particularly applies to Pine Relicts, Hemlock Relicts, and Algific Talus Slopes. Lyons and collaborators (2010) note that Wisconsin models predict major declines in the occurrence of many fish species in response to a warmer climate. Trout are particularly vulnerable to these impacts, as they are very sensitive to changes in water temperature. The Coldwater Fish and Fisheries Working Group (Wisconsin's Initiative on Climate Change Impacts; WICCI 2011) developed watershed-scale models to predict the changes in coldwater habitat and associated fish distributions, and found that brook trout could be completely lost by the middle of the 21st century from Wisconsin streams under the worst-case scenario for climate change; a moderate scenario could incur a 94% loss of brook trout populations, while the 'best-case' scenario could result in the loss of 44%. Lastly, the magnitude and frequency of intense rain events are anticipated to increase with climate change. Heavy downpours increase the chances of flooding, which can damage or destroy habitats within and beyond established floodplains. Floodplain Forest trees do not tolerate prolonged saturated soils associated with flooding and may be supplanted by invasive plants such as reed canary grass as trees are lost, especially if increased deposition of sediment also occurs (WICCI 2011).

The unique topography of the Driftless Area presents opportunities to mitigate the impacts of climate change on vulnerable plants, animals, and natural communities. This could involve maintaining high canopy cover on north facing slopes, helping to maintain a cool microclimate for northern species. Maintaining canopy cover and diverse ground flora in spring recharge areas may also help increase rainwater infiltration, which in turn supplies springs and streams. Adaptation strategies that are recommended for riparian settings include promoting stream bank and channel stability, reducing erosion and siltation, and protecting streams from damaging flood events (WICCI 2011).

High Conservation Value Forests

The Wisconsin DNR manages 1.5 million acres that are certified by the Forest Stewardship Council (FSC) (Forest Stewardship Council 2009) and the Sustainable Forest Initiative (SFI). Forest certification requires forests to be managed using specified criteria for ecological, social, and economic sustainability. Principle 9 of the "Draft 7 FSC-US Forest Management Standard" concerns the maintenance of High Conservation Value Forests (HCVF). High Conservation Value Forests are defined as possessing one or more of the following:

- Contain globally, regionally, or nationally significant concentrations of biodiversity values, including rare, threatened, or endangered species and their habitats.
- Globally, regionally, or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
- Are in or contain rare, threatened, or endangered ecosystems.
- Provide basic services of nature in critical situations (e.g., watershed protection, erosion control).
- Are fundamental to meeting basic needs of local communities (e.g., subsistence, health).
- Are critical to local communities' traditional cultural identity (areas of cultural, ecological, economic, or religious significance identified in cooperation with such local communities).



Southern Mesic Forest at Eureka Maple Woods SNA.
Photo by Ryan O'Connor

Wisconsin's Statewide Forest Strategy

Wisconsin's Statewide Forest Assessment (WDNR 2010b) was based on Wisconsin's Forest Sustainability Framework (Wisconsin Council on Forestry 2008) and was designed to assess the current state of Wisconsin's public and private forests and analyze the sustainability of our forested ecosystems. Wisconsin's Statewide Forest Strategy (WDNR 2010c) contains a collection of strategies and actions designed to address the management and landscape priorities identified in the Statewide Forest Assessment. The strategies are broad guides intended to focus the actions of the forestry community.

All three of these documents include topics related to biological diversity in Wisconsin's forests, and provide information useful for department master planning and management activities. The following strategies, organized using their number in the Statewide Forest Strategy document, are particularly pertinent to Driftless Area Study Streams planning efforts in terms of opportunities to maintain or enhance biological diversity (WDNR 2010c).

Strategy Number	Strategy
1	Encourage planting to enhance, protect, and connect larger tracts of forested land in appropriate locations consistent with ecological landscapes.
5	Pursue the conservation and protection of large, unfragmented blocks of forest lands.
11	Encourage the management of under-represented forest communities.
12	Improve all forested communities with a landscape management approach that considers the representation of all successional stages.
13	Increase forest structure and diversity.
14	Encourage the use of disturbance mechanisms to maintain diverse forest communities.
15	Maintain the appropriate forest types for the ecological landscape while protecting forest health and function.
22	Strive to prevent infestations of invasive species before they arrive.
23	Work to detect new (invasive species) infestations early and respond rapidly to minimize impacts to forests.
24	Control and manage existing (invasive species) infestations.
25	Rehabilitate, restore, or adapt native forest habitats and ecosystems.
29	Attempt to improve the defenses of the forest and increase the resilience of natural systems to future climate change impacts.
30	Intentionally accommodate (climate) change and enable forest ecosystems to adaptively respond.

Deer herbivory

The current level of the white-tailed deer (*Odocoileus virginianus*) herd in Wisconsin has become a significant barrier to the conservation of biodiversity and sustainable forest management (WDNR 2010d). Herbivory by white-tailed deer has been identified as a major disturbance contributing to ecological simplification of Wisconsin's forests (Rooney et al. 2004, Kovach et al. 2006, Wisconsin Council on Forestry 2008, WDNR 2010d). Deer herbivory impacts songbirds, small mammals (Flowerdew and Ellwood 2001), invertebrate populations (Allombert et al. 2005), and rare plant abundance and frequency by altering natural community composition and structure. Deer herbivory causes a decreased cover in the shrub and sapling layer which negatively impacts species richness and abundance of songbirds that nest in that layer (DeCalesta 1994, McShea and Rappole 2000). Although there are many factors affecting long-term changes in Wisconsin's forests, including invasive species and surrounding landscape condition, impacts from deer, in combination with other factors, remain a primary source of ecological change (Waller et al. 2009).

Community Level Opportunities and Considerations

The Wisconsin Wildlife Action Plan (WDNR 2006a) identifies 37 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Western Coulee & Ridges** Ecological Landscapes. Eighteen of these natural communities are present on Driftless Area Study Streams properties:

<u>Major Opportunity</u>	<u>Important Opportunity</u>
Algific Talus Slope	Northern Dry-mesic Forest
Cedar Glade	Pine Barrens
Coldwater streams	Southern Sedge Meadow
Dry Cliff	
Dry Prairie	
Emergent Marsh	
Floodplain Forest	
Hemlock Relict	
Moist Cliff	
Oak Barrens	
Pine Relict	
Shrub Carr	
Southern Dry Forest	
Southern Dry-mesic Forest	
Southern Mesic Forest	

The Wisconsin Wildlife Action Plan (WDNR 2006a) also identifies 17 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Southwest Savanna** Ecological Landscapes. One of these natural communities is present on Driftless Area Study Streams properties: Coldwater streams (Important Opportunity).

Although all of the above communities have been identified on Driftless Area Study Streams properties, only some are high quality, or have medium to high restoration potential. These include:

Oak Savanna (Oak Opening, Oak Woodland, Oak Barrens)

Historically, Oak Openings were abundant in Wisconsin, covering approximately 5.5 million acres (Curtis 1959) south of the Tension Zone. Review of historical literature indicates that Oak Openings once supported an exceptionally diverse flora, about 25% of the entire native flora of Wisconsin (Leach and Givnish 1999). Of the about 75,000 acres (Hoffman 2009) of Oak Opening remaining in Wisconsin, many of these are highly degraded or have succeeded to closed-canopy oak forests. The few extant remnants are mostly on drier sites, with the mesic and wet-mesic Oak Openings almost totally destroyed by conversion to agricultural or residential uses and by the encroachment of other woody plants due to fire suppression. Oak Woodland once occupied approximately 1.4 million acres (Curtis 1959) in pre-widespread Euro-American settlement Wisconsin; today, it is extraordinarily rare – only about 140,000 acres remain in the state (Hoffman 2009). Most of these remnants are highly degraded and have converted to closed-canopy oak forest. Oak Barrens historically occupied approximately 1.8 million acres in Pre-European Settlement Wisconsin (Richard Henderson, personal communication), but is now reduced to approximately 95,000 acres (Hoffman 2009; includes both pine and oak barrens).

Opportunities exist on Driftless Area Study Streams properties to restore Oak Openings, Oak Woodlands, and Oak Barrens, and to increase their connectivity. Such actions would also improve habitat for many plants and animals that are specialists of grassland, savanna, woodland, and barrens. Typical oak savanna restorations in Wisconsin require aggressive and intensive management for a period of 15 or more years. This reflects the highly degraded state of most sites, and the time and effort required to effectively restore system structure and function. Be aware that limited short-term efforts could result in merely a structural restoration with no ecosystem functionality, and may be considered wasteful. Also bear in mind that many former oak savannas are now closed-canopy forests that provide critical habitat for numerous bird species. Ecological restoration that converts closed-canopy forests to oak savanna may benefit some savanna specialist species at the expense of other species. As with all ecological restoration opportunities, sufficient resources must be available to ensure success of the project before the difficult decision of limiting habitat for some species in favor of other species is made. For State Natural Areas within the Driftless Area Study Streams study area, refer to the “Oak Savanna Management Guide” in the WDNR State Natural Area Handbook.

Primary sites (Figure 10, Appendix G) that have high restoration potential for Oak Opening and Oak Woodland sites include Trout Creek Uplands (Iowa County), Big Spring Creek (Iowa County), Snow Bottom SNA (Grant County), Rush Creek SNA (Crawford County), Hulbert Creek Woods SNA (Sauk County), and Tainter Creek (Vernon County); Trump Coulee Rearing Station in Jackson County (not a Primary Site) also harbors similar opportunities. Sites with high potential for Oak Barrens restoration include Trout Creek Uplands Primary Site in Iowa County and Tank Creek Fishery Area in Jackson County.

Communities of Coulees, Gorges, Cliffs, and Slopes

The Driftless Area's deeply dissected landscape includes coulees, gorges, cliffs, and shaded north-facing slopes that produce exceptionally cool and protected environments. These habitats often support relict communities in which northern species are prominent. Many Midwestern endemics and habitat specialists with limited distribution occur in these settings. Natural communities in the study area that are associated with coulees, gorges, cliffs and north-facing slopes include Southern Mesic Forest, Pine Relict, Dry Cliff, Moist Cliff, and Algific Talus Slope.

Southern Mesic Forest once occupied nearly 3,450,000 acres in Wisconsin, but only about 50,000 acres now remain due to fragmentation and conversion to agriculture (Hoffman 2002). Large and intact mesic forests can be rich repositories of native flora not found in other forest communities, particularly spring ephemerals. A number of good examples of Southern Mesic Forest occur within the Driftless Area Study Streams study area: at Coon Creek Fishery Area and Coon Creek Cliffs SNA in Vernon County, La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County, Eureka Maple Woods & Portland Maples SNA in Monroe County, Pinnacle Rock Rearing Station in Monroe County, and Milancthon Creek in Richland County.

Pine Relict is a forest type that occurs as discrete, isolated stands in the Driftless Area of southwestern Wisconsin. Pine Relicts are vulnerable to degradation because they are often small, isolated, and located on heavily erodible soils. Managing these forests within a mosaic of other forest communities can help negate the native species losses, impacts from invasive species, and erosion of thin soils that threaten this globally rare natural community. Good examples of Pine Relict are found at Castle Rock Creek Fishery Area and Snow Bottom SNA in Grant County.

Rare plants that are highly dependent on Driftless Area cliffs or talus slopes include the following: muskroot (*Adoxa moschatellina*), jeweled shooting star (*Dodecatheon amethysteum*), rock clubmoss

(*Huperzia porophila*), purple-stem cliff-brake (*Pellaea atropurpurea*), and Shinner's three-awned grass (*Aristida dichotoma*). Many bat species are dependent on caves, tunnels and abandoned mines in cliffs for roost sites and hibernacula. Fractured limestone outcrops can provide important snake hibernacula sites as well. Cliffs are prominent throughout the study area, the highest quality examples of which occur at Castle Rock Creek Fishery Area in Grant County, Coon Creek Fishery Area in Vernon County, at La Crosse Area Comprehensive Fishery Area on Tainter Creek in Vernon County, at Snow Bottom SNA in Grant County, and at La Valle Mill Pond on the Baraboo River in Sauk County.

Algific Talus Slopes are extraordinarily rare communities restricted to the Driftless Area and have been documented at just a few locations in Wisconsin. The biota of these unusual communities is especially unique in its representation of plants (e.g. the state and federally threatened northern wild monkshood) and land snails (e.g. broad-banded forestsnail [*Allogona profunda*] and Cherrystone Drop [*Hendersonia occulta*]) that were apparently stranded in these cold microclimates thousands of years ago. Only one Driftless Area Study Streams site is known to harbor Algific Talus Slope: Coon Creek Fishery Area in Monroe County.

Cold-Water Streams, Cool-Water Streams, Springs, Spring Seeps, and Riparian Wetlands

The porous sandstones of the Driftless Area retain large amounts of water, which are released at thousands of locations throughout the region via springs and spring seeps. Springs and seeps maintain constant flows of cold, clear, oxygenated water if they have not been compromised by channelization, heavy grazing, removal of forest or grassland cover, or excess sedimentation from row crop agriculture and construction activities (WDNR In prep a). The extensive network of cool-water streams in the Driftless Area support significant populations of rare, pollution-intolerant invertebrates, rare nongame fish, and native brook trout. Most of these coldwater streams are designated trout streams.

Of the 10,851 known springs in Wisconsin, more than 4,000 are documented in the Driftless Area (Macholl 2007), contributing significantly to the region's coldwater streams and their biota. These vital sources of groundwater discharge need to be protected from degradation, including reduced flow, increases in temperature, and contamination by polluted runoff (excess nutrients and sediments). At this time Wisconsin's groundwater protection law applies to only about 3% of springs statewide, thus continued advocacy for stream and groundwater protection is essential. Groundwater contamination not only negatively affects springs, but also the streams into which the springs discharge, emphasizing the importance of identifying and removing sources of groundwater contamination. Limitation of nonpoint pollution runoff, groundwater withdrawal, and extensive timber harvests, along with restoration of native plant cover within the recharge area of springs, will help protect these important natural features along with the streams and native flora and fauna that they support (WDNR In prep. a).

In 2011, 41 Driftless Area Stream properties in eight counties were sampled to locate conservation opportunities for aquatic invertebrates. Although no federal or state listed species were collected, three Special Concern species and eight SGCN were collected. Of the 41 sites, 11 were identified as having excellent water quality. Perceived water quality is based on the presence of water quality indicators: turbidity, chlorine or toxic scour, macrophytes, filamentous algae, planktonic algae, slimes, iron bacteria, and marl. Possible factors affecting water quality, such as silt and sediments, impoundment, and non-natives, were noted at each site as were possible pollutant sources. A summary of water quality surveys at all of the survey sites are listed below in Table 9.

Table 9. Water quality assessments performed during aquatic invertebrate surveys in 2011

Excellent	Good	Fair	Poor
Buffalo River Fishery Area	Beaver Creek Rearing Station	Beaver Creek Rearing Station	Halls (Stockwell) Creek Fishery Area
Fennimore Fork Castle Rock Creek	Buffalo River Fishery Area (4 sites)	Buffalo River Fishery Area (2 sites)	REM-Blue River
Hulbert Creek Fishery Area	Halls (Stockwell) Creek Fishery Area (2 sites)	Cooley Creek	REM-Milancthon Creek
Mount Hope Rearing Station	Mount Hope Rearing Station	Copper Creek (La Crosse Area Comp)	Smith Pond FA
Pinnacle Rock Rearing Station (2 sites)	REM-Big Spring Creek (2 sites)	Halls (Stockwell) Creek Fishery Area North Branch	Willow Creek FA
REM-Big Spring Creek	REM-Elk Creek	Trempealeau River FA	
REM-Hansell Creek	Trump Coulee Creek	REM-Pompey Pillar Creek	
REM-Pompey Pillar Creek	Willow Creek FA	Rush Creek	
Sand Creek		Tank Creek FA	
Tank Creek FA		Willow Creek FA (2 sites)	

Riparian wetlands, most often in the form of narrow, linear corridors, are common throughout the study area. They serve to slow the release of water during storms (thus minimizing flooding), filter nutrients and pollutants that are carried in runoff, and provide moisture banks during low water periods or droughts. Riparian wetlands also provide vital habitat to many animals, as well as natural corridors for their migration. Many of the wetlands in the study area have been ditched, drained or tiled, thus limiting the many ecosystem services enumerated above. These important wetland services could be reactualized by restoring their hydrology, stream morphology, and native vegetation. A number of significant restoration projects are, in fact, already underway on Driftless Area Study Streams sites, and will serve as important models for future projects in the study area and the region.

Restoration of riparian wetlands throughout the study area represents a vast undertaking that could require significant money, time, and other resources. A number of resources are available to assist managers in identifying the highest priorities for restoration based on elements of native biodiversity (or potential to support them), likelihood of project success based on landscape context and local support, and other factors:

- The Driftless Area Restoration Effort (DARE), is a "geographically focused, locally driven, consensus based effort to protect, restore, and enhance rivers and streams for fish and other aquatic life throughout the Driftless Area" (Trout Unlimited n.d.). DARE is embraced by a broad partnership of federal, state, and local government, landowners, academic institutions, conservation organizations, and sporting groups. The DARE coalition is working to prioritize watershed focus areas and projects, implement conservation actions with measurable outcomes, and raise public awareness about Driftless Area natural resources through outreach and education. The WDNR is a partner in the DARE coalition.
- The WDNR Bureau of Watershed Management, Lakes and Wetlands Section, has developed a comprehensive *Wisconsin Wetlands: Assessment Methods and Tools* webpage with numerous forms and protocols for assessing wetland conditions.

- This Rapid Ecological Assessment report and supporting field data can help identify streams and/or riparian corridors that support rare aquatic invertebrates, herptiles, small mammals, birds, and plants, as well as identify streams with high-quality surrounding uplands that can be managed in a manner compatible with riparian restoration.
- The WDNR collects macroinvertebrate samples from hundreds of sites annually for the purpose of assessing stream water quality (Lillie et al 2003). The University of Wisconsin - Stevens Point (UWSP) “Bug” database captures the survey data and produces a series of over 30 biological community attributes from each sample. Species tolerance, one of the attributes, provides a measure of the sensitivity of aquatic organisms to anthropogenic disturbance (Yuan 2006). For example, taxa lists at impaired and reference sites can be compared in terms of the presence or absence of taxa with different tolerance values to infer possible sources of stress. The loss of particularly sensitive taxa could also provide an early indication of impairment. The attributes from each sample are reported on the Surface Water Integrated Monitoring System (SWIMS) web site available to WDNR staff. Figure 10 shows UWSP Bug data points and an average of species tolerance values from each sample site. The circled dots are samples taken at a Driftless Area Study Streams property. Table 9 shows Driftless Area Stream properties that have samples in the UWSP Bug database and the average species richness and tolerance value for each property. Less impaired waters have a lower Tolerance Value.

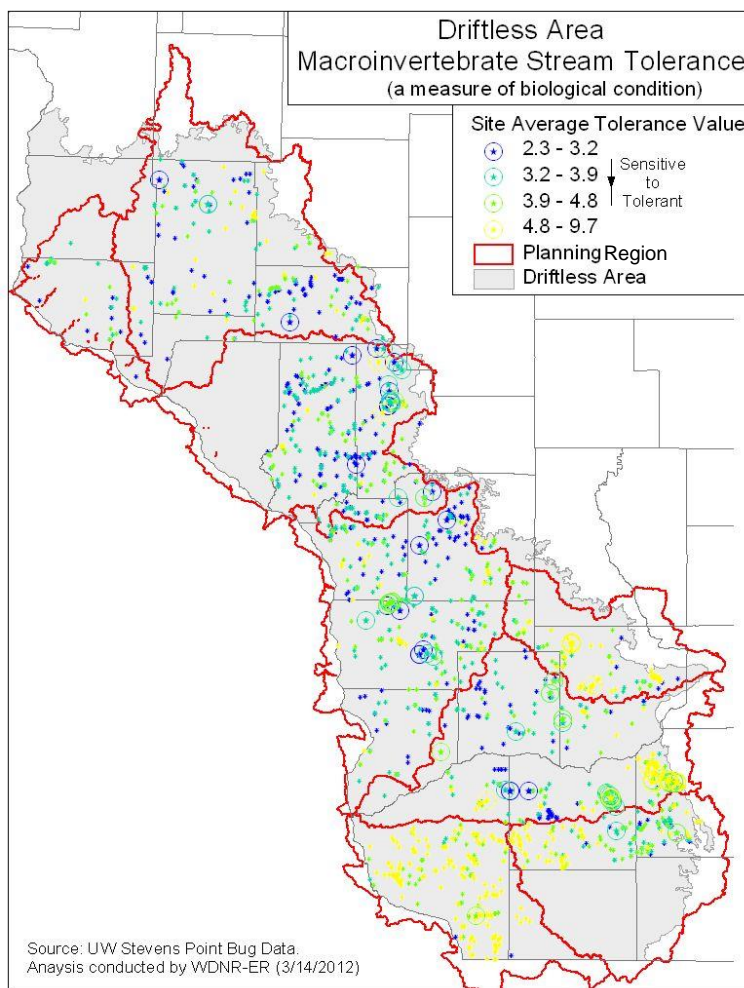


Figure 10. Driftless Area Macroinvertebrate Stream Tolerance.
(The Driftless Area is divided into Planning Regions, zones created by the WDNR bureaus of Fisheries and Facilities and Lands for the Master Planning process.)

Species or Taxa Level Opportunities and Considerations

Wildlife Action Plan Priority Communities and Conservation Actions

The Wisconsin Wildlife Action Plan identifies ecological priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the SGCN. Appendix E highlights the Ecological Priorities for vertebrate SGCN on Driftless Area Study

Streams properties. Note that these Ecological Priorities include all of the natural communities that we have determined to provide the best opportunities for management from an ecological/biodiversity perspective.

The Wildlife Action Plan also describes Priority Conservation Actions that make effective use of limited resources and address multiple species with each action. Implementing these actions and avoiding activities that may preclude successful implementation of these actions in the future would greatly benefit the SGCN on Driftless Area Stream properties. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the Southwest Savanna and Western Coulees & Ridges Ecological Landscapes that apply to Driftless Area Study Streams properties include:

- Focus management and restoration efforts in the loess-influenced forest Conservation Opportunity Areas to emphasize a matrix of older oak-central hardwood forest with smaller patches of oak woodland, oak opening, regenerating younger forest, native prairies and relict forests.
- Focus management and restoration efforts in the sandstone-influenced Conservation Opportunity Areas to emphasize dry oak savanna, oak woodland and sand prairie communities with smaller embedded patches containing oak forest, pine relicts, dry prairie, open shrubby barrens, closed canopy oak forest, and rock outcrops.
- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide migratory bird stopover habitat, and provide suitable habitat for species that require large areas or are dependent upon a mosaic of interconnected habitats, including a full range of seral stages, for their long-term survival.
- Maintain and connect large blocks of older floodplain forest to provide habitat for the large number of SGCN that utilize this habitat while addressing the regeneration difficulties associated with dense stands of reed canary grass.
- Restore oak openings and woodlands and expand and enhance dry prairie and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
- Partner with prairie/savanna/forest restoration groups to manage and protect habitats to effectively keep SGCNs on the landscape.
- Manage the sand and gravel-influenced floodplain forest of the Lower Chippewa and Lower Black Rivers for floodplain savanna conditions to help the recovery of eastern Massasauga rattlesnake (*Sistrurus catenatus catenatus*).
- Manage appropriate native sand prairie and sand prairie restoration sites for nesting Ornate Box (*Terrapene ornata*) and Blanding's Turtles (*Emydoidea blandingii*).
- Conduct research on the interspecies competition between increasing "channel" shiners and the greatly decreasing pallid shiner (*Notropis amnis*).
- Protect and restore appropriate habitat in the Mississippi and Lower Wisconsin Rivers for Shoal Chub (*Macrhybopsis aestivalis*).
- Focus restoration of stream habitat and morphology on areas where land use and other factors suggest the most successful outcomes.
- Protect and restore appropriate natural stream habitat with focus on accommodating the habitat needs of Wood Turtle (*Glyptemys insculpta*).
- Protect and restore Ozark Minnow (*Notropis nubilis*) habitat in the watersheds and tributaries of the Platte River.

Forest Interior Bird Conservation

The larger Driftless Area region (including southeast Minnesota, northwest Illinois, and northeast Iowa) represents one of the best opportunities in the upper Midwest for forest interior bird habitat management, particularly for species that depend on southern forest types (Wilson 2008). This is due, in part, to the fact that much of this rugged landscape has escaped extensive development, thus harboring significant tracts of forest. The four-state Driftless Area also provides vital stopover habitat for migratory birds: the Upper Mississippi River (which transects the Driftless Area) and its tributaries provide migration corridors for more than half of North America's bird species. The region also provides important breeding habitat for numerous declining forest interior bird species. State-owned fisheries property managers can play an important role in meeting the needs of forest interior birds by implementing recommendations identified in the Driftless Area Initiative's 2008 report on integrating habitat considerations and forest management planning within the tri-state Driftless Area (Wilson 2008).

In the aforementioned Driftless Area Initiative report (Wilson 2008), 17 species were identified as primary members of the forest interior bird guild known to nest in the tri-state Driftless Area of the Upper Mississippi River Basin. Of these, 12 were identified as breeding on WDNR Driftless Area Study Streams properties (Table 10).

Many of the rare forest interior birds found on Driftless Area Study Streams properties have had significant population declines in Wisconsin and throughout their range. Breeding Bird Survey data show an annual decline of 4.4% for cerulean warblers (*Dendroica cerulea*) in Wisconsin (Mossman 2006). Other forest interior birds that may be declining include Acadian flycatcher (*Empidonax virescens*), least flycatcher (*Empidonax minimus*) and veery (*Catharus fuscescens*). Species that have had population increases continue to be threatened by the edge effects of forest fragmentation.

Table 10. Breeding forest interior birds known from Driftless Area Study Streams.

Listing status is based on the NHI Working List published June 2011. Also included are common species that require forest interior habitat. See appendix F for explanation of state status.

Common Name	Scientific Name	State Status
Acadian flycatcher	<i>Empidonax virescens</i>	Threatened
cerulean warbler	<i>Dendroica cerulea</i>	Threatened
hooded warbler	<i>Wilsonia citrina</i>	Threatened
Kentucky warbler	<i>Oporornis formosus</i>	Threatened
least flycatcher	<i>Empidonax minimus</i>	Special Concern
Louisiana waterthrush	<i>Seiurus motacilla</i>	Special Concern
ovenbird	<i>Seiurus aurocapilla</i>	
prothonotary warbler	<i>Protonotaria citrea</i>	Special Concern
red-shouldered hawk	<i>Buteo lineatus</i>	Threatened
veery	<i>Catharus fuscescens</i>	Special Concern
wood thrush	<i>Hylocichla mustelina</i>	Special Concern
yellow-billed cuckoo	<i>Coccyzus americanus</i>	Special Concern

Primary determinants of interior forest habitat quality include stand composition, age, size, structure, canopy closure, proximity to water or roads, slope and aspect, stand size and shape, and proximity to other stands on the landscape (Wilson 2008). Limiting fragmentation associated with, but not limited to, clear-cutting, road building, or utility and pipeline development is important to the continued viability of these large blocks of forest and their associated bird species (WDNR 2006a).

Maintaining the vertical structural diversity currently found within less fragmented forest stands is also important for some forest interior species. Cerulean, Kentucky (*Oporornis formosus*), and hooded (*Wilsonia citrina*) warblers, as well as veery and wood thrush (*Hylocichla mustelina*) all require a complexity of forest layers for nesting. These species use both shrub and tree species. Some forest interior birds also rely on limb structure that promotes horizontal canopy nesting areas.

Oak savanna and Oak Woodlands, in the context of large contiguous forest patches, can provide a ‘soft edge’ between other habitat types and a closed-canopy forest. Oak Woodland restoration, within a large forested area, could promote understory growth and development of full-canopied oaks that produce horizontal limb structure for nesting that is favorable for cerulean warblers and other area-sensitive species such as Kentucky warbler, hooded warbler, veery, and wood thrush.

Maintaining and expanding large blocks of contiguous, older forests in the Driftless Area is critical for the future of many forest interior birds. A number of Driftless Area Study Streams properties offer opportunities within a landscape context to provide habitat for these species, especially those that are in or near the following Important Bird Areas (WDNR 2007b): Van Loon Bottoms and Kickapoo-Wildcat. Primary sites that provide excellent habitat and likely support source populations of forest interior birds in the Driftless Area are Half Moon Bottoms Floodplain Forest, Eureka Maple Woods and Portland Maples SNA, Rush Creek Coulees and Ridges, Snow Bottom SNA, Trout Creek Uplands, Pinnacle Rock Rearing Station, Tainter Creek, Rush River Delta SNA, and Hulburt Creek Woods SNA (Figures 9 and 10; Appendix G). These areas should be considered for maintaining forest interior bird populations.

Within the study area, one frequently encounters ridgetops that were historically converted to old-fields and are embedded within a forested landscape. These grassland sites should be evaluated for potential for reforestation. Although these areas may currently provide some habitat for grassland-dependent species, there are expansive grassland landscapes elsewhere in the state where grasslands are a clear priority and where large tract sizes probably contribute to higher rates of nest success, and where the entire prairie plant-animal community is more intact; but there are very few forested landscapes that are suitable for high densities of forest interior birds and their associated plant-animal community (M. Mossman, personal communication).

Grassland Bird Conservation

Biologists and birders are concerned about population declines of many grassland bird species. Since the North American Breeding Bird Survey began in 1966, grassland birds have declined more steeply than any other group of birds in North America and the Midwest (Sample and Mossman 1997, Askins et al. 2007). Driftless Area Study Streams properties provide breeding habitat for at least 21 grassland bird species (Table 11). Grassland bird habitat in the study area occurs in the form of old fields, former CRP fields, open riparian wetlands, and barrens.

Grassland bird habitat is most effectively maintained as large landscapes of continuous grassland, uninterrupted by hedgerows, with the cover of woody plants less than 5% (Sample and Mossman 1997). Hedgerows fragment grasslands and provide habitat/movement corridors for predators of grassland birds. Structural diversity within the grassland, including shrubs, short and tall grass, amount of residual herbaceous duff, a mix of grasses and forbs, and a management rotation of type, intensity, and frequency, is also important.

Table 11. Breeding grassland and shrubland birds known from Driftless Area Study Streams.

Listing status is based on the NHI Working List published June 2011.

Common Name	Scientific Name	State Status
Bell's vireo	<i>Vireo bellii</i>	Threatened
blue-winged warbler	<i>Vermivora pinus</i>	Special Concern
bobolink	<i>Dolichonyx oryzivorus</i>	Special Concern
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	
brown thrasher	<i>Toxostoma rufum</i>	Special Concern
clay-colored sparrow	<i>Spizella pallida</i>	
common yellowthroat	<i>Geothlypis trichas</i>	
eastern bluebird	<i>Sialia sialis</i>	
eastern meadowlark	<i>Sturnella magna</i>	Special Concern
field sparrow	<i>Spizella pusilla</i>	Special Concern
golden-winged warbler	<i>Vermivora chrysoptera</i>	Special Concern
grasshopper sparrow	<i>Ammodramus savannarum</i>	Special Concern
red-winged blackbird	<i>Agelaius phoeniceus</i>	
Henslow's sparrow	<i>Ammodramus henslowii</i>	Threatened
lark sparrow	<i>Chondestes grammacus</i>	Special Concern
northern harrier	<i>Circus cyaneus</i>	Special Concern
sedge wren	<i>Cistothorus platensis</i>	
song sparrow	<i>Melospiza melodia</i>	
swamp sparrow	<i>Melospiza georgiana</i>	
vesper sparrow	<i>Pooecetes gramineus</i>	Special Concern
willow flycatcher	<i>Empidonax traillii</i>	Special Concern

The best opportunities for promoting grassland bird habitat are at Sand Creek Streambank Protection Area in Monroe County (~130 acres of barrens/shrubland/surrogate grassland), Bear Creek Sedge Meadow SNA and Fishery Area in Sauk and Richland Counties (~700 acres of wetland and surrogate grassland), Beaver Creek Rearing Station in Jackson County (~130 acres of surrogate grassland/shrubland), and the La Crosse River Fishery Area in Monroe County (113+ acres of Sand Prairie/Oak Barrens). The La Crosse River site is within the Fort McCoy – Robinson Creek Important Bird Area, designated for its importance to grassland and savanna birds. Areas with marginal habitat for grassland-dependent species, such as ridgetops and old-fields embedded within a forested landscape should be evaluated for potential for reforestation; see additional discussion in the previous section on forest interior birds.

Invertebrate Conservation

Terrestrial Insects

A number of uncommon terrestrial invertebrate species, especially Lepidopterans, are present or have the potential to occur on Driftless Area Study Streams properties, particularly sites with Southern Sedge Meadow, Wet-mesic Prairie, Dry Prairie, Sand Prairie, Oak Barrens, and Pine Barrens. The small remaining acreages and isolation of these community types throughout their historic range in Wisconsin have threatened the population viability of many invertebrates. During field visits in 2011, few rare and uncommon species were observed. However, the field biologist using their background and community

knowledge used their scientific opinion to identify nine Driftless Area Streams properties as harboring healthy or extensive wetlands that could provide potential habitat for wetland invertebrates, while seven upland sites were identified as having potential for supporting grassland or barrens invertebrates:

Potential wetland invertebrate sites

- Bear Creek Fishery Area
- Big Creek Fishery Area
- Milancthon Creek Fishery Area
- Maple Dale Creek
- Mt. Vernon Creek Fishery Area
- Rulland's Coulee Creek
- Rush Creek Fishery Area
- Tainter Creek
- Trout Creek Fishery Area

Potential upland invertebrate sites

- Beaver Creek Fish Rearing Station
(Northfield Lake State Fishery Area)
- Big Creek Fishery Area
- Blue River Fishery Area South
- Camp Creek Public Fishing Area
- La Crosse River Fishery Area
- Rush Creek Fishery Area south
- Sand Creek Fishery Area

Managing fire-dependant communities with their associated rare Lepidoptera can be a challenge. Martin and Hoffman (1990) addressed this subject in "Managing Lepidoptera on State Natural Area Prairies." Even though the guidance is for prairies, many of the concepts are applicable to other fire-dependant communities as well. The excerpt below is an example of methods used on State Natural Areas and is intended solely to underscore the delicate balance of trying to avoid losing a population through lack of management or through overly aggressive management:

The extensive fires that occurred in this landscape prior to European settlement killed billions of insects each and every time they occurred. However, these fires rarely burned the entire landscape. Patches of habitat were often left unburned and patterns of burn intensity varied enough to reduce the impacts on insects. Following these fires, the incredible fecundity (ability to reproduce) of most insects would permit rapid recolonization of their habitat.

In today's landscape, though, prairies are fragmented into smaller remnants, which often are separated by miles of unacceptable habitat for certain Lepidoptera (butterflies, skippers, and moths). Could our prescribed burning or other management eliminate a rare butterfly population?

Lepidoptera management is a subject area with much speculation and strongly held views. Endangered Resources staff have talked to butterfly experts and attended workshops on Lepidoptera management and have learned that prescribed burning must be done with care to avoid inadvertently stressing a species beyond recovery. Some Lepidoptera species are clearly sensitive to fire. For many, recolonization accelerates population recovery. Since it is difficult to say with certainty how a species will recover when burning an entire site, it is important that we take precautions to protect populations of these species when conducting burns. One way to preserve prairie insects is to divide the area to be burned into units and burn some, but not all, of those units in any one year. We incorporate this technique into the management plans for all of our State Natural Areas. First, we determine management goals for the entire natural area. In the case of prairie communities, a major goal usually includes improving the quality and size of the prairies through burning. Then we determine what species of concern are found on a particular area and which of these will be affected by our management. Larger prairie areas increase the likelihood that the affected species can be retained. The area is divided into burn units, and we devise a burning schedule that will

allow those rare species to seek shelter in the unburned areas or build up a population large enough to recolonize the burned area, in case such backup is needed.

Although this type of management requires additional time and expense, it is a necessary precaution to ensure that the entire insect component of our natural communities is preserved while maintaining the natural fire regime under which the community has evolved. Prairie plants and insects depend on each other; protecting these interrelationships is well worth the extra effort.

Terrestrial/Land Snails

During June 2011, 51 Driftless Area Stream properties in 14 counties were visited to locate conservation opportunities for terrestrial snails. Wisconsin's snail species all represent remnant populations from the pre-European settlement period. Land snails, in general, have a slow rate of dispersal and without suitable habitat or habitat corridors they can not disperse or expand as a viable population(s). With the historic fragmentation and loss of native communities as a result of Euro-American disruption, few intact habitats remain that will support the rarer native snail populations. Terrestrial snail habitat includes depressions in rocky exposures with pockets of leaf litter, under or adjacent to decaying downed logs of deciduous trees, under loose tree bark on downed logs, or at protected locations on seasonally moist cliff faces. In prairie/savanna settings, habitat includes detritus adjacent to clumps of prairie grasses or rock exposures, and downed wood.

Cherrystone drop (State Threatened) as living colonies were found at six Driftless Area Streams locations. Cherrystone drop is a Pleistocene relict, finding suitable habitat niches in the protected, steep slopes of the Driftless Area. The steep, rocky hillsides of the region provide protective north- and east-facing habitat niches, where underlying voids in the rocky substrate and accumulating leaf litter are not easily disturbed by livestock grazing, clear cutting, or cultivation. Three locations also produced broad-banded forestsnail (Special Concern); both living snails and fresh shells were found. These locations were in historic fire shadow zones and protected by the rugged terrain. These larger-sized snail species are vulnerable to predation by rodents and insectivores that can negatively impact population density. Other rare terrestrial snails that were observed include domed disk (*Discus patulus*; Special Concern), dull gloss (*Zonitoides limatulus*; Special Concern), and ribbed striate (*Striatura exigua*; Special Concern).

Conclusions from the terrestrial snail survey in the Driftless Area Study Streams include:

- 1) The Driftless Area stream corridors that were least disturbed by historic Euro-American practices held the highest potential for rare terrestrial snail populations in remnant habitats. In general, these were the areas with the greatest topographic relief.
- 2) The poorest habitats for terrestrial snails included areas that have been cultivated, subjected to intense livestock grazing, and/or heavily logged.
- 3) Some species of rare terrestrial snails can survive limited selective logging, especially if invasive plants such as garlic mustard are not introduced by logging equipment.
- 4) Terrestrial snails associated with prairie and oak savanna can diminish or disappear if woody invasion reaches advanced stages in the absence of fire.
- 5) Access to areas below moist sand stone cliffs should be limited, as they are fragile and can be easily damaged by foot traffic.

Small Mammal Communities of the Driftless Area

Small mammals play an important role in ecosystem function, serving as prey for numerous predators, as a necessary means of disturbance for plant communities, by spreading mycorrhizal fungi, and by

influencing the size and composition of some insect communities. Many native small mammals have declined both in range and abundance in the past 100 years due to habitat degradation and destruction (Stephens 2011). Given their relatively short dispersal capabilities, loss of these animals from an area makes it very difficult for them to recolonize unless a local source population exists nearby. Thus, it is important to determine the extent to which these sensitive species occur and when found, utilize adaptive management techniques in order to allow the species to persist as part of a functioning ecosystem.

Targets for small mammal surveys in the Driftless Area focused on rare species associated with various prairie and savanna habitat types along with open and forested wetlands. Prairie and surrogate grassland habitats with sandy soils hold potential to support prairie vole (*Microtus ochrogaster*) and prairie deer mouse (*Peromyscus maniculatus bairdii*). One prairie deer mouse was captured in Jackson County at a dry sand prairie. No prairie voles were found during this effort, but suitable sandy grassland conditions to support this and the prairie deer mouse exist at several properties surveyed. However, the lack of connectivity of grassland areas at these properties limits the likelihood of repopulation if individuals are in fact gone from these areas.

Southern Dry Forests and oak savanna are habitats strongly associated with the woodland vole (*Microtus pinetorum*). Although oak savanna types are globally rare, good-quality or restorable examples of savanna are still found within the Driftless Area. No woodland voles were captured during surveys, but properties with potential habitat to support this species were found at Trout and Love Creeks in Iowa County, Tainter Creek in Vernon County, and Rush Creek in Grant County. Surprising finds from the small mammal surveys were two records of water shrew (*Sorex palustris*) in Jackson County, which was formerly not known to occur in this region of the state (Stephens 2011). They are associated with small, fast-flowing cold water streams and were found in a sedge meadow/Alder Thicket at one site and a southern hardwood forest at a second site. Protecting water quality and natural stream habitat are important management considerations for water shrews.

Herptile Conservation

The vast majority of the study area falls within the Western Coulees and Ridges Ecological Landscape, an area offering the best opportunities in the state for herptile conservation. There are 17 herptile species significantly associated with this Ecological Landscape, more than in any other ecological landscape in Wisconsin (WDNR 2006a). The importance for herptiles in this region stems from the diversity of habitats present here, including undeveloped landscapes, and prevalent sandy soils, aquatic resources, and wetlands. Many of these habitats are found within the Driftless Area Study Streams properties, and ten of the associated rare species significantly associated with this area are documented from the study area (Table 12). Remnants of prairies, barrens, and oak savannas are all critically important habitats for snakes and lizards found here. Aquatic resources and wetlands associated with streams and rivers of the Driftless Area provide habitat for the rare amphibians and turtle species.

Table 12. Rare reptiles and amphibians of the Driftless Area and the Study Area.

Common Name	Scientific Name	State Status	Known from Study Area
Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	Yes
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Special Concern	Yes
Gophersnake	<i>Pituophis catenifer</i>	Special Concern	Yes
Gray Ratsnake	<i>Pantherophis spiloides</i>	Special Concern	Yes
Northern Cricket Frog	<i>Acris crepitans</i>	Endangered	Yes
Ornate Box Turtle	<i>Terrepenne ornata</i>	Endangered	Yes

Common Name	Scientific Name	State Status	Known from Study Area
Pickerel Frog	<i>Lithobates palustris</i>	Special Concern	Yes
Slender Glass Lizard	<i>Ophisaurus attenuatus</i>	Endangered	Yes
Timber Rattlesnake	<i>Crotalus horridus</i>	Special Concern	Yes
Wood Turtle	<i>Glyptemys insculpta</i>	Threatened	Yes
Eastern Massasauga	<i>Sistrurus catenatus catenatus</i>	Endangered	No
North American Racer	<i>Coluber constrictor</i>	Special Concern	No
Prairie Ring-necked Snake	<i>Diadophis punctatus arnyi</i>	Special Concern	No
Prairie Skink	<i>Plestiodon septentrionalis</i>	Special Concern	No
Six-lined Racerunner	<i>Aspidoscelis sexlineata</i>	Special Concern	No
Smooth Softshell	<i>Apalone mutica</i>	Special Concern	No
Western Wormsnake	<i>Carphophis vermis</i>	Special Concern	No

Habitat loss is a major threat to reptile populations. The Driftless Area offers significant opportunities for coordinated management of prairies, barrens, and savannas, all critical habitats for a suite of declining reptiles. By providing a continuum of these management dependant natural communities, the habitat needs for numerous wildlife species are maximized, and their safe movement from one location to the next is ensured. Birds are extremely mobile, but other animals like small mammals and herptiles need to have suitable habitat connections to enable them to repopulate areas and to fulfill their life history requirements. The Driftless Area historically provided large expanses of prairie, barrens and Oak Opening with connections to limestone outcrops and oak woodlands. These connections are significant for improving snake and lizard populations by enabling access to critical areas for basking and thermoregulation, overwintering, staging, nesting, and foraging. Management aimed at retaining or restoring open qualities of prairies, barrens, and savannas by controlling brush and invasive species would benefit many reptile species. Extensive spotted knapweed (*Centaurea biebersteinii*) populations are thought to deter reptile nesting in Sand Prairies and should be a priority for control efforts (Bob Hay, personal communication). Maintaining open grassland, barrens and savanna habitats for herptiles will also benefit many bird and invertebrate species that rely on these habitat types as well.

Considerable inventory effort for this project was put into identifying snake den sites and searching for rare snakes. No new snake dens were found, but (Hay 2010) noted several areas with potential to serve as snake hibernacula. Open Sand Prairies, sand blows, and open surrogate grasslands with sandy soils are important turtle nesting sites and have good potential to support sand-loving reptiles (slender glass lizard [*Ophisaurus attenuatus*], gophersnake [*Pituophis catenifor*], and ornate box turtle). Maintaining open, native prairie, barrens, and savanna communities is a critical management consideration for ensuring the viability of both den and nesting sites.

Stream and riparian area habitat projects aimed at enhancing trout populations can effectively be combined to improve habitat for many common and rare reptiles and amphibians. The Natural Resources Conservation Service (NRCS) has produced an outstanding resource entitled “Driftless Riparian Habitat Guide” (Hastings 2009) outlining habitat



Pickerel frog in watercress. By Rich Staffen.

requirements for many stream/riparian-dependant herptiles, along with projects for developing habitat for non-game species in conjunction with trout stream restorations. Several stream enhancement projects were observed during herptile inventories which created amphibian breeding pools that were supporting excellent numbers of tadpoles, eggs, and adult frogs. These included high numbers of pickerel frogs (*Lithobates palustris*) and habitat with good potential to support northern cricket frogs (*Acris crepitans*). With the abundance of springs and coldwater tributaries in the project area, high numbers of pickerel frogs were found in the study area and should be considered an important conservation target for the area. Northern cricket frogs were once commonly found throughout the southern half of Wisconsin, but a dramatic range contraction has led to them largely being restricted to the extreme southwestern portion of the state. Historical occurrences are scattered throughout the Driftless Area and recent populations have been verified in Vernon County, but the bulk of the current population resides in the extreme southern portion of the Western Coulee and Ridges Ecological Landscape and the entire Southwest Savanna Ecological Landscape. These are where efforts should be focused to protect populations and create habitat for this endangered species.

Bat Conservation

By feeding on insects, bats are an important component of healthy ecosystems. The Driftless Area of Wisconsin is particularly rich in known and potential bat hibernacula sites. Opportunities to promote bat habitat at Driftless Area Study Streams properties include providing resources for roosting, foraging, and drinking.

Acoustical bat surveys were conducted at eight sites due to their suspected importance for bat conservation. While no hibernacula were identified on Driftless Area Study Streams properties, surveys detected all seven bat species known to summer in Wisconsin, including three that are State Threatened. No more than five species were observed at a given site.

Foraging is done in small to medium forest openings or gaps, in other natural and artificial openings such as ponds, and along roads or water courses (Taylor 2006). Maintaining diverse forest flora and reducing non-native plant abundance is important for promoting invertebrate prey diversity and thus promoting foraging opportunities for bats (WDNR 2006a).

Maintaining high-water quality and access to water is important for protecting bat populations. Wide buffers (generally wider than those recommended in Best Management Practices for water quality (WDNR 2010d)) around water, including rivers, streams, and wet meadows, are important for bats and other wildlife species using these areas (Taylor 2006).

Hibernaculum disturbance, habitat degradation, and wind-turbine mortality are threats that affect all bat species found in Wisconsin. An emerging threat to Wisconsin's bats, White-Nose Syndrome (WNS) has been called the "most precipitous wildlife decline in the past century in North America" by Bat Conservation International and has devastated bat populations in the eastern United States since 2006. It has recently been discovered that the fungus *Geomyces destructans* is the causal agent of White-Nose Syndrome (Lorch et al. 2011). Due to the emerging threats that bat populations face in Wisconsin, more information in the form of surveys (acoustic and roost) are needed to more accurately describe the bats that use Driftless Area Study Streams properties.

Primary Sites: Site-specific Opportunities for Biodiversity Conservation

Of the 174 properties evaluated, 17 ecologically important sites were identified in the Driftless Area Study Streams study area (Figures 11 and 12). These Primary Sites were delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

Descriptions for each of the Primary Sites can be found in Appendix G. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site's ecological significance, and management considerations. Appendix H lists the rare species and high-quality natural communities currently known at each Driftless Area Study Streams Primary Site.

Driftless Area Study Streams Primary Sites

DAS01	Copper Creek
DAS02	Half Moon Bottoms Floodplain Forest
DAS03	Eureka Maple Woods & Portland Maples SNA
DAS04	Bear Creek Wetlands
DAS05	Coon Creek Cliffs SNA
DAS06	Sand Creek Pines and Barrens
DAS07	LaCrosse River Pine-Oak Barrens
DAS08	Rush Creek Coulees and Ridges
DAS09	Snow Bottom SNA
DAS10	Trout Creek Uplands
DAS11	Pinnacle Rock Rearing Station
DAS12	Milancthon Creek
DAS13	Big Spring Creek
DAS14	Tainter Creek
DAS15	Rush River Delta SNA
DAS16	Hulburt Creek Woods SNA
DAS17	Buffalo River Trail Prairies SNA

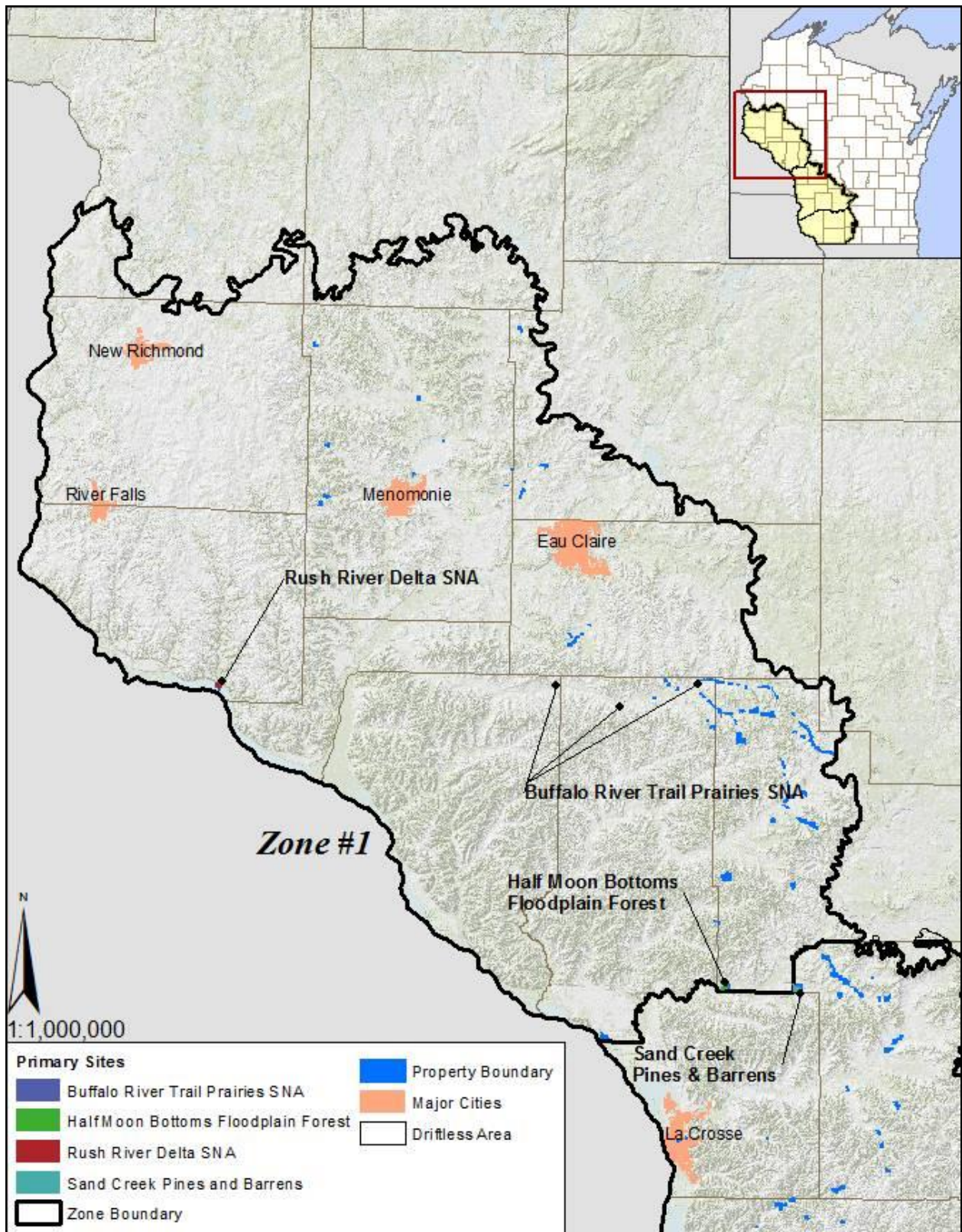


Figure 11. Primary Sites of Driftless Area Study Streams (Zone 1)

(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)

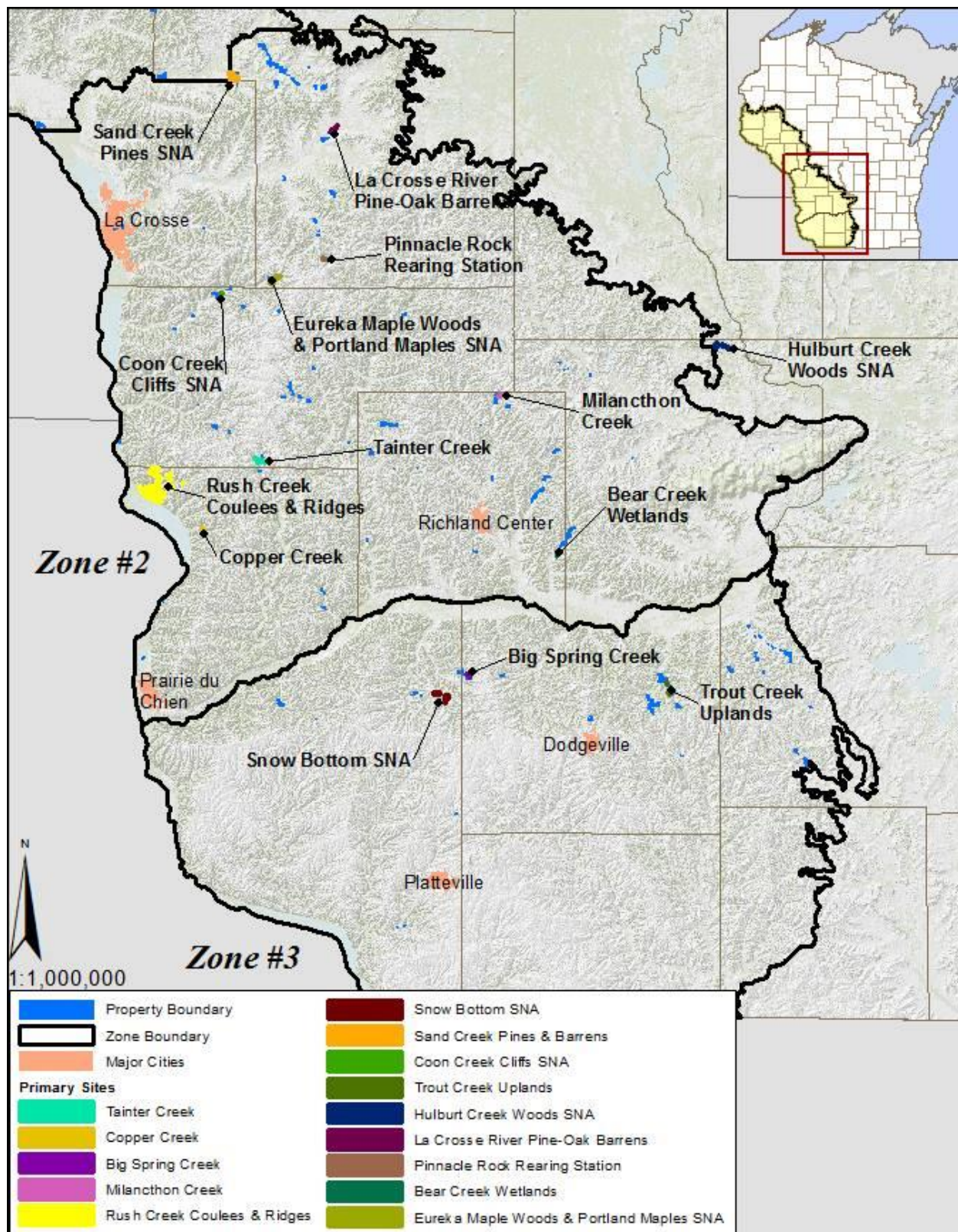


Figure 12. Primary Sites of Driftless Area Study Streams (Zones 2 and 3)
(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)

Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for Driftless Area Study Streams managed lands. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species contained in Driftless Area Study Streams managed lands.

- Continued to monitor and control non-native invasive species. In order to protect the important biodiversity values of Driftless Area Study Streams, a comprehensive non-native invasive species monitoring and control plan will be needed for detecting and rapidly responding to new non-native invasive threats.
- Utilize the DNR-SWIMS application (Surface Water Integrated Monitoring System website available to WDNR staff) to identify and locate impaired waters or emerging water quality issues using the macroinvertebrate species tolerance values.
- Continue to identify, protect, and restore headwater systems (including spring seeps and springs). Headwater systems are important for attenuating floods, maintaining water supplies, preventing siltation of downstream streams and rivers, maintaining water quality, and supporting biodiversity. Headwater systems, used by many animal species at different stages in their life history, provide shelter, food, and protection from predators, spawning sites and nursery areas, and travel corridors between terrestrial and aquatic habitats.
- Refer to table 1 in overview of methods section to identify survey gaps and sites without ground reconnaissance.
- Continue to partner on efforts like The Driftless Area Restoration Effort (DARE), to protect, restore, and enhance rivers and streams for fish and other aquatic life throughout the Driftless Area.
- Continue to conduct public outreach and education on streambank protection throughout the Driftless Area.
- In May and June 2011, 41 Driftless Area Stream properties in 8 counties were sampled to locate conservation opportunities for aquatic invertebrates. Over 900 species samples were collected and keyed out for identification.
- While not documented on or near any of the Driftless Area Streams properties, it is worthy of special mention the recent discovery of a population of the Federally Endangered Hine's emerald dragonfly (*Somatochlora hineana*) in the Lower Wisconsin State Riverway. Potential breeding sites can be characterized as open herbaceous wetlands with a minor shrub component, near or adjacent to the upland sand terrace bordering the floodplain, with spring seeps or runs discharging into the wetland from the terrace (above and or below the surface), and with burrowing crayfish present.
- Continue to survey and monitor for aquatic inverts in streams in the region. While there has been a great deal of survey effort in the region, it still remains undersampled because of the variety of habitats that occur here. As a result of the 2011 Biotic Inventory, several species that were considered uncommon in the state were located at several sites, indicating that they may not be as rare as previously thought, but rather that their preferred habitats are under-surveyed. Aquatic invertebrate data is a useful tool for monitoring stream health and for identifying streams in need of conservation and management action.

Glossary

Ecological Landscape - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

element - the basic building blocks of the Natural Heritage Inventory. They include natural communities, rare plants, rare animals, and other selected features such as colonial bird rookeries, bat hibernacula, and mussel beds. In short, an element is any biological or ecological entity upon which we wish to gather information for conservation purposes.

element occurrence - an Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historic) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., a single nest territory or long-distance dispersers) or a group of nearby populations (e.g., metapopulation). For communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

endemic - native to or confined to a certain region.

graminoid – a grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), arrow-grasses (Juncaginaceae), and quillworts (Isoetes).

Karst topography - a landscape that is characterized by numerous caves, sinkholes, fissures, and underground streams. Karst topography usually forms in regions of plentiful rainfall where bedrock consists of carbonate-rich rock, such as limestone, gypsum, or dolomite, that is easily dissolved.

Landtype Association (LTA) - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

loess - windblown deposit of fine-grained, calcareous silt or clay.

natural community - an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.

representative - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

SGCN (or “Species of Greatest Conservation Need”) – native wildlife species with low or declining populations that are most at risk of no longer being a viable part of Wisconsin's fauna (from the “Wisconsin Wildlife Action Plan,” WDNR 2006).

Species List

The following is a list of species referred to by common name in the report text.

Animals

Common Name	Scientific Name
Acadian flycatcher	<i>Empidonax virescens</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
broad-banded forest snail	<i>Allogona profunda</i>
brook trout	<i>Salvelinus fontinalis</i>
cerulean warbler	<i>Dendroica cerulea</i>
cherrystone drop	<i>Hendersonia occulta</i>
domed disk	<i>Discus patulus</i>
dull gloss	<i>Zonitoides limatulus</i>
eastern Massasauga rattlesnake	<i>Sistrurus catenatus catenatus</i>
emerald ash borer	<i>Agrilus planipennis</i>
European earthworms	<i>Acanthodrilidae, Lumbricidae, Megascloedidae</i>
gophersnake	<i>Pituophis catenifer</i>
Hine's emerald dragonfly	<i>Striatura exigua</i>
hooded warbler	<i>Wilsonia citrina</i>
Kentucky warbler	<i>Oporornis formosus</i>
least flycatcher	<i>Empidonax minimus</i>
northern cricket frog	<i>Acris crepitans</i>
ornate box turtle	<i>Terrapene ornata</i>
Ottoe's skipper	<i>Hesperia ottoe</i>
ozark minnow	<i>Notropis nubilus</i>
pallid shiner	<i>Notropis amnis</i>
pickerel frog	<i>Lithobates palustris</i>
prairie deer mouse	<i>Peromyscus maniculatus bairdii</i>
prairie vole	<i>Microtus ochrogaster</i>
ribbed striate	<i>Striatura exigua</i>
rusty crayfish	<i>Orconectes rusticus</i>
shoal chub	<i>Macrhybopsis aestivalis</i>
slender glass lizard	<i>Ophisaurus attenuatus</i>
veery	<i>Catharus fuscescens</i>
water shrew	<i>Sorex palustris</i>
woodland vole	<i>Microtus pinetorum</i>
wood thrush	<i>Hylocichla mustelina</i>
wood turtle	<i>Glyptemys insculpta</i>
zebra mussel	<i>Dreissena polymorpha</i>

Plants

Common Name	Scientific Name
American hazelnut	<i>Corylus americana</i>
American pasqueflower	<i>Anemone patens</i>
arrowheads	<i>Sagittaria</i> spp.
azure aster	<i>Aster oolentangiensis</i>
basswood	<i>Tilia americana</i>
big bluestem	<i>Andropogon gerardii</i>
black ash	<i>Fraxinus nigra</i>
black cherry	<i>Prunus serotina</i>
black oak	<i>Quercus velutina</i>
bloodroot	<i>Sanguinaria canadensis</i>
blueberries	<i>Vaccinium</i> spp.
blue cohosh	<i>Caulophyllum thalictroides</i>
blue flag	<i>Iris versicolor</i>
blue-joint grass	<i>Calamagrostis canadensis</i>
brambles	<i>Rubus</i> spp.
broad-leaved cat-tail	<i>Typha latifolia</i>
bulblet fern	<i>Cystopteris bulbifera</i>
bulrushes	<i>Scirpus</i> spp.
bur oak	<i>Quercus macrocarpa</i>
bur-reeds	<i>Sparganium</i> spp.
Canada goldenrod	<i>Solidago canadensis</i>
cat-tails	<i>Typha</i> spp.
chinquapin oak	<i>Quercus muhlenbergii</i>
cinnamon fern	<i>Osmunda cinnamomea</i>
columbine	<i>Aquilegia canadensis</i>
common buckthorn	<i>Rhamnus cathartica</i>
common polypody	<i>Polypodium vulgare</i>
Culver's root	<i>Veronicastrum virginicum</i>
currants	<i>Ribes</i> spp.
cut-leaved coneflower	<i>Rudbeckia laciniata</i>
early low blueberry	<i>Vaccinium angustifolium</i>
eastern cottonwood	<i>Populus deltoides</i>
false Solomon's-seal	<i>Maianthemum racemosum</i>
flowering spurge	<i>Euphorbia corollata</i>
fragile ferns	<i>Cystopteris</i> spp.
frostweed	<i>Helianthemum</i> spp.
garlic mustard	<i>Alliaria petiolata</i>
giant goldenrod	<i>Solidago gigantea</i>
goat's-rue	<i>Tephrosia virginiana</i>
gold-thread	<i>Coptis trifolia</i>
gray dogwood	<i>Cornus racemosa</i>
green ash	<i>Fraxinus pennsylvanica</i>
hackberry	<i>Celtis occidentalis</i>
hairy hawkweed	<i>Hieracium longipilum</i>
hairy panic grass	<i>Dicanthelium acuminatum</i>
harebell	<i>Campanula rotundifolia</i>

Common Name	Scientific Name
hazelnuts	<i>Corylus</i> spp.
hickory	<i>Carya</i> spp.
Hill's oak	<i>Quercus ellipsoidalis</i>
hog-peanut	<i>Amphicarpaea bracteata</i>
honey locust	<i>Gleditsia triacanthos</i>
huckleberry	<i>Gaylussacia baccata</i>
jack pine	<i>Pinus banksiana</i>
jeweled shooting star	<i>Dodecatheon amethysteum</i>
jumpseed	<i>Polygonum virginianum</i>
juneberry	<i>Amelanchier</i> spp.
June grass	<i>Koeleria macrantha</i>
Kentucky coffee-tree	<i>Gymnocladus dioica</i>
lake sedge	<i>Carex lacustris</i>
leadplant	<i>Amorpha canescens</i>
Leonard's skullcap	<i>Scutellaria leonardii</i>
little bluestem	<i>Schizachyrium scoparium</i>
long-branch frostweed	<i>Helianthemum canadense</i>
maples	<i>Acer</i> spp.
mayapple	<i>Podophyllum peltatum</i>
mountain maple	<i>Acer spicatum</i>
multiflora rose	<i>Rosa multiflora</i>
muskroot	<i>Adoxa moschatellina</i>
needle grass	<i>Stipa spartea</i>
New Jersey tea	<i>Ceanothus americana</i>
New England aster	<i>Aster novae-angliae</i>
non-native bush honeysuckle	<i>Lonicera</i> spp.
northern bush-honeysuckle	<i>Diervilla lonicera</i>
northern water-horehound	<i>Lycopus uniflorus</i>
northern wild monkshood	<i>Aconitum novaboracense</i>
oaks	<i>Quercus</i> spp.
old field goldenrod	<i>Solidago nemoralis</i>
orange jewelweed	<i>Impatiens capensis</i>
pale corydalis	<i>Corydalis sempervirens</i>
panniced aster	<i>Aster lanceolatus</i> var. <i>simplex</i>
paper birch	<i>Betula papyrifera</i>
partridge-berry	<i>Mitchella repens</i>
pipsissewa	<i>Chimaphila umbellata</i>
prairie cord grass	<i>Spartina pectinata</i>
prairie drop-seed	<i>Sporobolus heterolepis</i>
prairie willow	<i>Salix humilis</i>
prickly ash	<i>Zanthoxylum americanum</i>
purple-stem cliff-brake	<i>Pellaea atropurpurea</i>
rattlesnake-root	<i>Prenanthes alba</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red-osier dogwood	<i>Cornus stolonifera</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>

Common Name	Scientific Name
river birch	<i>Betula nigra</i>
rock clubmoss	<i>Huperzia porophila</i>
rock spikemoss	<i>Selaginella rupestris</i>
rusty woodsia	<i>Woodsia ilvensis</i>
sawtooth sunflower	<i>Helianthus grosseserratus</i>
shagbark hickory	<i>Carya ovata</i>
shooting-star	<i>Dodecatheon meadia</i>
Shinner's three-awn grass	<i>Aristida dichotoma</i>
side-oats grama	<i>Bouteloua curtipendula</i>
silver maple	<i>Acer saccharinum</i>
skunk cabbage	<i>Symplocarpus foetidus</i>
speckled alder	<i>Alnus incana</i>
spotted Joe-Pye-weed	<i>Eupatorium maculatum</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
spring-beauty	<i>Claytonia virginica</i>
stiff goldenrod	<i>Solidago rigida</i>
stinging nettle	<i>Urtica dioica</i>
sugar maple	<i>Acer saccharum</i>
swamp aster	<i>Aster puniceus</i>
swamp milkweed	<i>Asclepias incarnata</i>
swamp white oak	<i>Quercus bicolor</i>
sycamore	<i>Platanus occidentalis</i>
tall meadowrue	<i>Thalictrum dasycarpum</i>
trilliums	<i>Trillium</i> spp.
trout-lilies	<i>Erythronium</i> spp.
tussock sedge	<i>Carex stricta</i>
violets	<i>Viola</i> spp.
Virginia waterleaf	<i>Hydrophyllum virginianum</i>
water-plantains	<i>Alisma</i> spp.
western sunflower	<i>Helianthus occidentalis</i>
white meadowsweet	<i>Spiraea alba</i>
white oak	<i>Quercus alba</i>
white pine	<i>Pinus strobus</i>
wild geranium	<i>Geranium maculatum</i>
wild lupine	<i>Lupinus perennis</i>
wild roses	<i>Rosa</i> spp.
wild sarsaparilla	<i>Aralia nudicaulis</i>
willows	<i>Salix</i> spp
winterberry holly	<i>Ilex verticillata</i>
wintergreen	<i>Gaultheria procumbens</i>
wood ferns	<i>Dryopteris</i> spp.
wood nettle	<i>Laportea canadensis</i>
woodland sunflower	<i>Helianthus strumosus</i>
yellow birch	<i>Betula alleghaniensis</i>
yellow coneflower	<i>Ratibida pinnata</i>

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Additional Resources

Numerous online resources are available for learning more about the rare species, natural communities, and ecological concepts contained within this report. These are just a few of the resources that we recommend. Use the WDNR search function to locate the appropriate and up-to-date WDNR web pages.

1. Bureau of Endangered Resources' Animals, Plants, and Communities Web Pages

Information for plants, animals, and natural communities on the Wisconsin Working List, as well as Species of Greatest Conservation Need from the Wisconsin Wildlife Action Plan. For reptiles and amphibians, information for more common species is also provided here. At this time, the level of detail available varies among species; some have detailed factsheets while others have only a short paragraph or a map. These pages will continue to evolve as more information becomes available and are the Bureau of Endangered Resources' main source of information for species and communities. *Go to the WDNR web pages and search "Endangered Resources" or "ER."*

2. Wisconsin Natural Heritage Inventory Working List

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. *Go to the WDNR web pages and search "working list."*

3. Ecological Landscapes of Wisconsin Handbook

Wisconsin's 16 Ecological Landscapes have unique combinations of physical and biological characteristics such as climate, geology, soils, water, or vegetation. This handbook will contain a chapter for each of these landscapes with detailed information about their ecology, socioeconomics, and ecological management opportunities. An additional introductory chapter will compare the 16 landscapes in numerous ways, discuss Wisconsin's ecology on the statewide scale, and introduce important concepts related to ecosystem management in the state. The full handbook is in development as of this writing, and chapters will be made available online as they are published. Currently, a set of Web pages provide brief Ecological Landscape descriptions, numerous maps, and other useful information, including management opportunities for natural communities and Species of Greatest Conservation Need. *Go to the WDNR web pages and search "ecological landscape."*

4. The Wisconsin Wildlife Action Plan

This plan is the result of a statewide effort to identify native Wisconsin animal species of greatest conservation need. The plan also presents priority conservation actions to protect the species and their habitats. The plan itself is available online, and there are several online tools to explore the data within the plan. The Web pages are closely integrated with the pages provided in items #1 and #3 above. The Wildlife Action Plan Web pages are quite numerous, so we recommend the following links as good starting points for accessing the information. *Go to the WDNR web pages and search "wildlife action plan."*

5. **Wisconsin's Biodiversity as a Management Issue - A Report to Department of Natural Resources Managers**

This now out-of-print report presents a department strategy for conserving biological diversity. It provides department employees with an overview of the issues associated with biodiversity and provides a common point of reference for incorporating the conservation of biodiversity into our management framework. The concepts presented in the report are closely related to the material provided in this report, as well as the other resources listed in this section. *Go to the WDNR web pages and search* "biodiversity as a management issue."

6. **Wisconsin's Statewide Forest Strategy**

Wisconsin's Statewide Forest Strategy is a collection of many strategies and actions designed to address major issues and priority topics over the next five to ten years. It provides a long-term, comprehensive, coordinated approach for investing resources to address the management and landscape priorities identified in the Statewide Forest Assessment. Several of the strategies contain issues related to biodiversity and ecosystem management. *Go to the WDNR web pages and search* "statewide forest strategy."

7. **2010 Wisconsin's Statewide Forest Assessment**

The goal of this project was to assess the "state of affairs" of Wisconsin's public and private forests and analyze the sustainability of our forested ecosystems. The Statewide Forest Assessment helps to explain trends, identify issues, and present an updated view of the status of forests in Wisconsin. The first chapter deals with biological diversity in Wisconsin's forests, and the major conclusions from this assessment were used to develop the strategies in # 6 above. *Go to the WDNR web pages and search* "statewide forest assessment."

8. **Oak Savanna State Natural Area Management Guide (Oak Opening, Oak Woodland, Oak Barrens). Chapter 100.60 of WDNR State Natural Areas Handbook.**

This management guide contains the Wisconsin Department of Natural Resources' format for addressing actions on State Natural Areas where the primary feature is oak savanna (more specifically, Oak Opening, Oak Woodland and Oak Barrens). The guide was developed in consultation with Department of Natural Resources savanna management specialists and property managers, and further supported by an analysis of peer-reviewed literature, and leads the reader through the process of developing a detailed management plan. An overview of management techniques is provided, along with pertinent regulations. This resource can be found on the "Manual Codes and Handbooks" Intranet website.

Appendix A

Natural Heritage Inventory Overview and General Methodology

This biotic inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program. The Wisconsin NHI program is part of the Wisconsin DNR's Bureau of Endangered Resources and a member of an international network of Natural Heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share standardized methods for collecting, processing, and managing data for rare species, natural communities, and certain other natural features (e.g., bird rookeries). NatureServe, an international non-profit organization, coordinates the network. This appendix provides a general overview of the methodology we use for these projects. Please see the NatureServe Web site for more detailed information about standard methods used by the Heritage Network (www.NatureServe.org) for locating, documenting, and ranking rare species and natural community occurrences.

General Process Used when Conducting Biotic Inventories for Master Planning

The Wisconsin NHI Program typically uses a “coarse filter-fine filter” approach to conducting biotic inventory projects for master planning. This approach begins with a broad assessment of the natural communities and aquatic features present, along with their relative quality and condition. The area's landforms, soils, topography, hydrology, current land uses, and the surrounding matrix are also evaluated using Geographic Information Systems (GIS) and other electronic and hardcopy data sources. Data that describe conditions for the area prior to Euro-American settlement are often used during this step and at other times to further understand the ecological capabilities of the area. Often, we consult with local managers, biologists, or others familiar with the ecology of the area when preparing for an inventory project. The goals for this step are to identify the important ecological attributes and biological processes present, as well as to focus our inventory efforts.

The level of survey intensity varies based on the size and ecological complexity of the property or group of properties, as well as the resources available. For larger properties such as state forests, biotic inventory efforts typically take more than one year. Ideally, taxa surveys are conducted following a coarse-filter analysis that sometimes include extensive natural community surveys. There is often time for “mop-up work” during the year following the completion of the main survey effort, whereby additional surveys are conducted for areas that could not be reached the first year or for which new information has become available. For smaller properties, a “Rapid Ecological Assessment” often takes the place of a full-scale biotic inventory. The level of effort for these projects varies based on the needs of the study area, although surveys are almost always completed during one field season. Coarse filter work for rapid assessments is often done based on GIS data, aerial photos, data acquired from previous efforts, and information from property managers and others knowledgeable about the area.

Taxa-specific surveys can be costly and intensive and sometimes must be completed during a very narrow period of time. For example, bird surveys must be completed within an approximately one-month time window. For this and several other reasons, ***our surveys cannot locate every rare species occurrence within a given area.*** Therefore, it is important to use resources as efficiently as possible, making every effort to identify the major habitats present in the study area from the start. This approach concentrates inventory efforts on those sites most likely to contain target species to maximize efficient use of resources. Communication among biologists during the field season can help identify new areas of interest or additional priorities for surveys. The goal is to locate species populations with the highest conservation value whenever possible.

After all of the data are collected, occurrences of rare species, high-quality natural communities, and certain other features are documented, synthesized, and incorporated into the NHI Database. The NHI program refers to this process as “mapping” the data and uses a tabular and spatial database application designed specifically for the Heritage Network. Other secondary databases are also used by the Wisconsin NHI Program for storing additional species and community information such as species lists, GPS waypoints, photos, and other site documentation.

Once the data mapping and syntheses are completed, the NHI Program evaluates data from the various department biologists, contractors, and other surveyors. This information is examined along with many other sources of spatial and tabular information including topographic maps, various types of aerial photography, digital soil and wetland maps, hydrological data, forest reconnaissance data, and land cover data. Typically, GPS waypoints and other spatial information from the various surveys are superimposed onto these maps for evaluation by NHI biologists.

In addition to locating important rare species populations and high-quality natural community occurrences, the major products culminating from all of this work are the “Primary Sites.” These areas contain relatively undisturbed, high-quality, natural communities; provide important habitat for rare species; offer opportunities for restoration; could provide important ecological connections; or some combination of the above factors. The sites are meant to highlight, based on our evaluation, the best areas for conserving biological diversity for the study area. They often include important rare species populations, High Conservation Value Forests, or other ecologically important areas.

The final report describes the Primary Sites, as well as rare or otherwise notable species, and other ecological opportunities for conserving or enhancing the biological diversity of the study area. The report is intended for use by department master planning teams and others and strives to describe these opportunities at different scales, including a broad, landscape context that can be used to facilitate ecosystem management.

Select Tools Used for Conducting Inventory

The following are descriptions of standard tools used by the NHI Program for conducting biotic inventories. Some of these may be modified, dropped, or repeated as appropriate to the project.

File Compilation: Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the NHI Database. Other databases with potentially useful information may also be queried, such as: forest reconnaissance data; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; the Wisconsin Breeding Bird Atlas; other NHI “atlas” and site databases; museum/herbarium collections for various target taxa; soil surveys; geological surveys; and the department’s fish distribution database.

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources, including the State Natural Area files, often contain information on a variety of subjects relevant to the inventory of natural features for an area.

Literature Review: Field biologists involved with a given project consult basic references on the natural history and ecology of the area, as well as any documented rare species. This sometimes broadens and/or sharpens the focus of the inventory efforts.

Target Elements: Lists of target elements including natural communities, rare plants and animals, and aquatic features are developed for the study area. Field inventory is then scheduled for the times when these elements are most identifiable or active. Inventory methods follow accepted scientific standards for each taxon.

Compilation of Maps and Other Spatial Data: USGS 7.5 minute topographic quadrangles, most often in digital form, serve along with aerial photos as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features. These are used in conjunction with numerous GIS layers, which are now a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth. These polygons have been digitized for most counties, and the resulting GIS layers can be superimposed onto other maps.

Ecoregion GIS layers are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. Ecological Landscapes provide the broad framework most often used in Wisconsin; however smaller units, including Landtype Associations, can be very helpful for evaluating ecoregions at finer scales.

Aerial photographs: These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. The Wisconsin NHI Program uses several different types of both color and black and white air photos. Typically, these are in digital format, although paired photos in print format can be valuable for stereoscopic viewing. High-resolution satellite imagery is often cost-prohibitive but is available for some portions of the state and is desirable for certain applications.

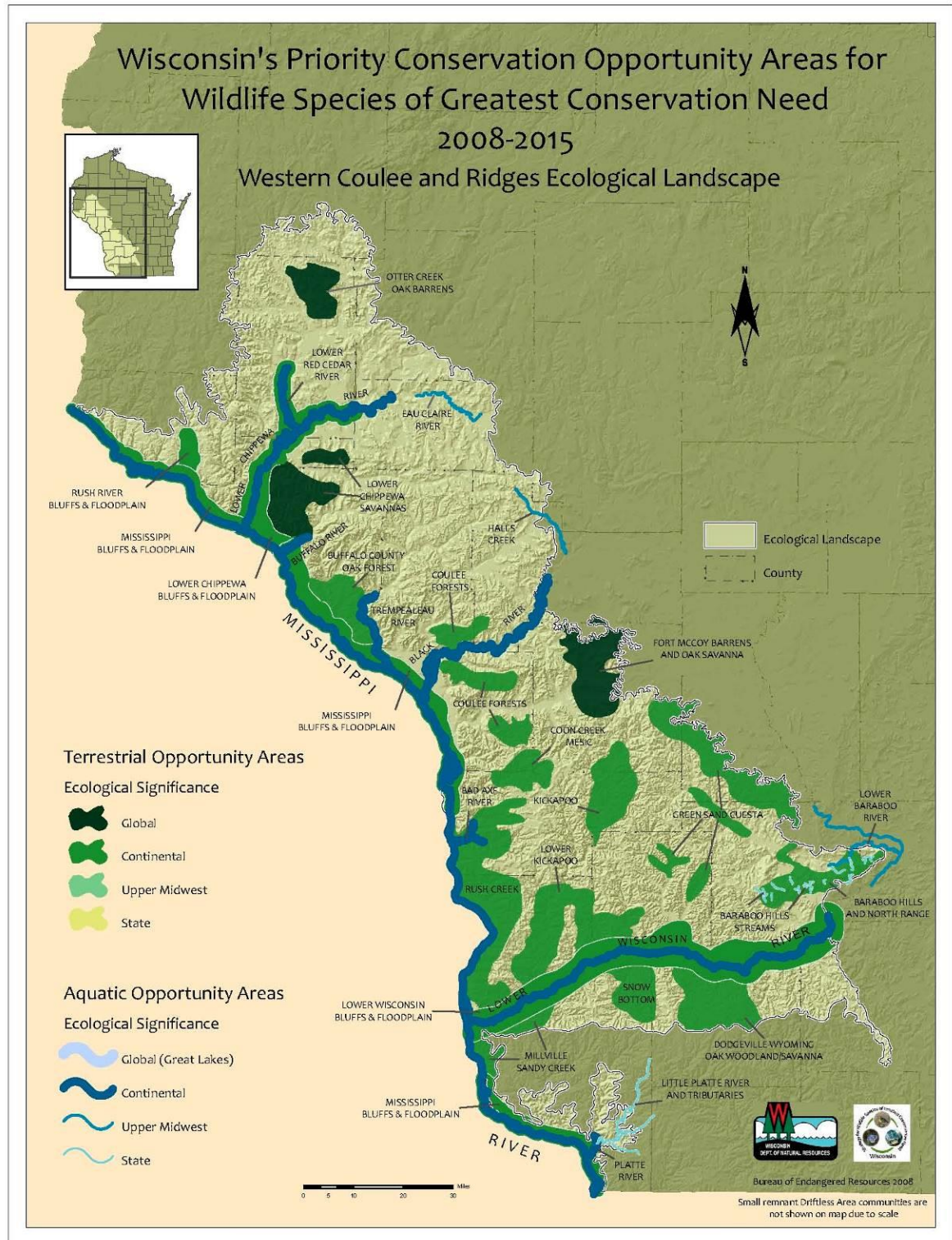
Original Land Survey Records: The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. Their notes also included general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns. The tree data are available in GIS format as raw points or interpreted polygons, and the notes themselves can provide helpful clues regarding the study area's potential ecological capabilities.

Interviews: Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield invaluable information.

Global Positioning Systems (GPS): Small, portable GPS units are now a routine piece of field equipment used for virtually all NHI survey work. Collecting coordinates (waypoints) facilitates mapping and makes it easy to quickly communicate specific locations among biologists. Often waypoints are paired with photos and/or other information and stored in a waypoint tracking database.

Aerial Reconnaissance: Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most easily identified and differentiated. They are also useful for observing the general lay of the land, vegetation patterns and patch sizes, aquatic features, infrastructure, and disturbances within and around the site.

Appendix B





Appendix C

Rare Species and High Quality Natural Communities of Driftless Area Study Streams

Numerous rare species and high-quality examples of native communities have been documented on Driftless Area Study Streams properties. This table shows the rare species and high-quality natural communities currently known from Driftless Area Study Streams and listed by WDNR-Fisheries and Facilities and Lands Planning Regions (created for the master planning process). There are eight Planning Regions in the Driftless Area Study (Figure 1). Driftless Area Study Streams are listed with their associated planning regions on pages 2-4. For an explanation of state and global ranks, as well as state status, see Appendix F. State status, tracking status, and ranks are based on the working list published June 1, 2011. Species with a “W” in the “Tracked by NHI” column are on the Watch List (see Appendix F) and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list.

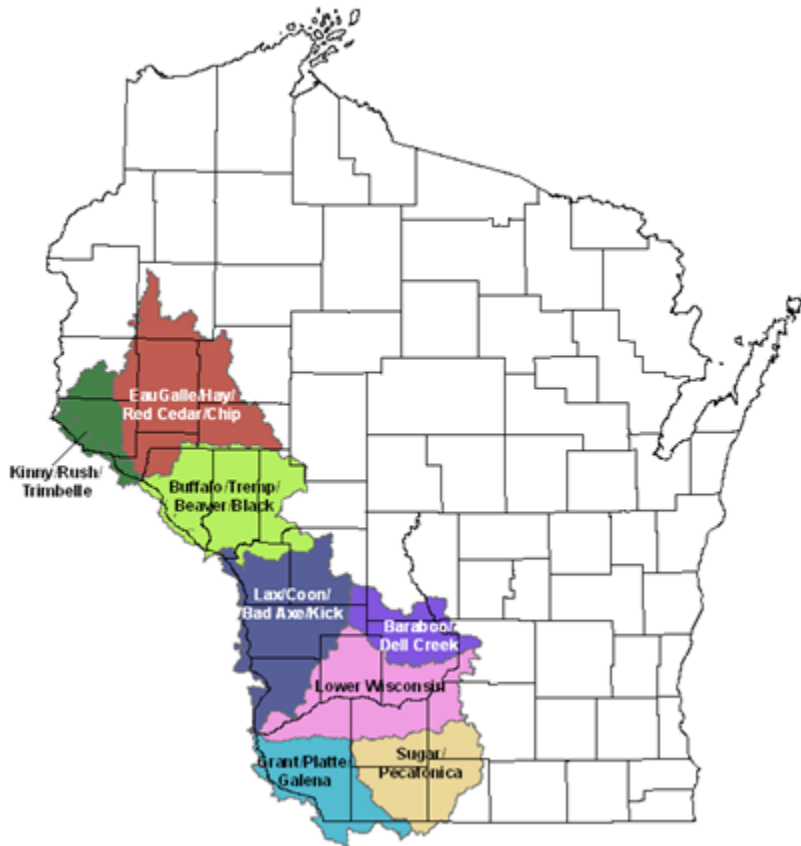


Figure 1. WDNR Fisheries / Facilities & Lands Master Planning Regions for Driftless Area Planning Group.

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Birds															
Acadian Flycatcher	Empidonax virescens						2011	2010		S3B	G5	THR		Y	Y
Bald Eagle	Haliaeetus leucocephalus			2001		2010		2010		S4B,S4N	G5	SC/P		Y	Y
Bell's Vireo	Vireo bellii						2002	1987		S2B	G5	THR		Y	Y
Black Tern	Chlidonias niger						2010			S2B	G4	SC/M		Y	Y
Cerulean Warbler	Dendroica cerulea					1984	2010	2010		S2S3B	G4	THR		Y	Y
Henslow's Sparrow	Ammodramus henslowii		2010					2010		S2S3B	G4	THR		Y	Y
Hooded Warbler	Wilsonia citrina		2011					2010		S2S3B	G5	THR		Y	Y
Kentucky Warbler	Oporornis formosus						2011			S1S2?B	G5	THR		Y	Y
Lark Sparrow	Chondestes grammacus		2010							S3B	G5	SC/M		Y	Y
Louisiana Waterthrush	Seiurus motacilla						2011	2010		S3B	G5	SC/M		Y	Y
Prothonotary Warbler	Protonotaria citrea					2010	2010			S3B	G5	SC/M		Y	Y
Red-shouldered Hawk	Buteo lineatus		2010			1984	2010			S3S4B,S1N	G5	THR		Y	Y
Fish															
American Eel	Anguilla rostrata		1977			2009	2009			S2	G4	SC/N		Y	Y
Black Buffalo	Ictiobus niger					1998	1998			S2	G5	THR		Y	Y
Black Redhorse	Moxostoma duquesnei							1928		S1	G5	END		Y	Y
Blue Sucker	Cycleptus elongatus	1900				2010	2010			S2	G3G4	THR		Y	Y
Goldeye	Hiodon alosoides					1995	2009			S2	G5	END		Y	Y

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Greater Redhorse	Moxostoma valenciennesi			2009						S3	G4	THR		Y	Y
Lake Sturgeon	Acipenser fulvescens			1998		1994				S3	G3G4	SC/H		Y	Y
Mud Darter	Etheostoma asprigene		2010			2002	2002	2009		S3	G4G5	SC/N			Y
Ozark Minnow	Notropis nubilus				2010					S2	G5	THR		Y	Y
Paddlefish	Polyodon spathula					2010				S2	G4	THR		Y	Y
Pallid Shiner	Notropis amnis					2003	2003			S1	G4	END		Y	Y
Pirate Perch	Aphredoderus sayanus	1993	2009				1994			S3	G5	SC/N			Y
Pugnose Minnow	Opsopoeodus emiliae		2001				2006			S3	G5	SC/N			Y
Redfin Shiner	Lythrurus umbratilis			1976						S2	G5	THR		Y	Y
River Redhorse	Moxostoma carinatum		2010							S2	G4	THR		Y	Y
Shoal Chub	Macrhybopsis aestivalis						1998			S2	G5	THR		Y	Y
Silver Chub	Macrhybopsis storeriana					2006	2006	1980		S3	G5	SC/N			Y
Skipjack Herring	Alosa chrysochloris					1993				S1	G5	END		Y	Y
Starhead Topminnow	Fundulus dispar		2010							S2	G4	END		Y	Y
Weed Shiner	Notropis texanus		2001			2008	2008	1972		S3	G5	SC/N			Y
Western Sand Darter	Ammocrypta clara		2010			2009	2009			S3	G3	SC/N		Y	Y
Mammals															
Big Brown Bat	Eptesicus fuscus							2010		S2S4	G5	THR			Y
Eastern Pipistrelle	Perimyotis subflavus						1949			S1S3	G5	THR			Y

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Water Shrew	Sorex palustris		2011							S3	G5	SC/N		Y	Y
Woodland Vole	Microtus pinetorum							1944		S2	G5	SC/N		Y	Y
Amphibians															
Northern Cricket Frog	Acris crepitans							2011		S1	G5	END		Y	Y
Pickerel Frog	Lithobates palustris		2010				2011	2011		S3?	G5	SC/H		Y	Y
Reptiles															
Blanding's Turtle	Emydoidea blandingii			2003			2001	2010		S3S4	G4	THR		Y	Y
Gophersnake	Pituophis catenifer		2009							S2S3	G5	SC/P		Y	Y
Gray Ratsnake	Pantherophis spiloides						2003			S3	G5T5	SC/P		Y	Y
Ornate Box Turtle	Terrapene ornata							1974		S1	G5	END		Y	Y
Plains Gartersnake	Thamnophis radix							2011		S2?	G5	SC/H			Y
Slender Glass Lizard	Ophisaurus attenuatus		2008				1990			S1	G5	END		Y	Y
Timber Rattlesnake	Crotalus horridus						1926	2009		S2S3	G4	SC/P		Y	Y
Wood Turtle	Glyptemys insculpta		1979				2011			S2	G4	THR		Y	Y
Butterflies and Moths															
Gorgone Checker Spot	Chlosyne gorgone						1994			S3	G5	SC/N			Y
Ottoe Skipper	Hesperia ottoe							1978		S1	G3G4	SC/N		Y	Y
Dragonflies and Damselflies															

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Sand Snaketail	Ophiogomphus smithi			2002			1969			S2	G2G3	SC/N		Y	Y
Slender Bluet	Enallagma traviatum						2010			S1S3	G5	SC/N		Y	Y
Stoneflies															
Quadrat Sallfly	Haploperla orpha			1995						S2S3	G4	SC/N		Y	Y
Mussels and Clams															
Buckhorn	Tritogonia verrucosa		2004			1932				S2	G4G5	THR		Y	Y
Butterfly	Ellipsaria lineolata					1931				S2	G4G5	END		Y	Y
Elephant Ear	Elliptio crassidens					1934				S1	G5	END		Y	Y
Elktoe	Alasmidonta marginata		2004							S3	G4	SC/P			Y
Fawnsfoot	Truncilla donaciformis					2000	2005			S1S2	G5	SC/P		Y	Y
Higgins' Eye	Lampsilis higginsii						2005			S1	G1	END	LE	Y	Y
Monkeyface	Quadrula metanevra					1978	1981			S2	G4	THR		Y	Y
Rock Pocketbook	Arcidens confragosus						1982			S1S2	G4	THR		Y	Y
Wartyback	Quadrula nodulata						1979			S1S2	G4	THR		Y	Y
Washboard	Megalonaias nervosa					1932	1979			S3	G5	SC/P			Y
Yellow & Slough Sandshells	Lampsilis teres					1931				S1	G5	END		Y	Y
Terrestrial Snails															
Broad-banded Forestsnail	Allogona profunda						2011	2011		S2S3	G5	SC/N			Y

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Cherrystone Drop	Hendersonia occulta						2011	2011		S2S3	G4	THR		Y	Y
Domed Disc	Discus patulus						2011			SU	G5	SC/N			Y
Dull Gloss	Zonitoides limatulus							2011		S1S2	G4G5	SC/N		Y	Y
Ribbed Striate	Striatura exigua		2011							S2S3	G5	SC/N			Y
Smooth Coil	Helicodiscus singleyanus					1987	1987			S2?	G5	SC/N			Y
Miscellaneous Elements															
Bat Hibernaculum	Bat Hibernaculum									S3	GNR	SC			Y
Bird Rookery	Bird Rookery					1987	1994			SU	G5	SC			Y
Herp Hibernaculum	Herp Hibernaculum							2008		SU	GNR	SC			Y
Karner Blue Federal High Potential Range	Karner Blue Federal High Potential Range		2012				2012			SNR	GNR	NA			Y
Plants															
American Fever-few	Parthenium integrifolium							1987		S3S4	G5	THR			Y
Broad Beech Fern	Phegopteris hexagonoptera							1901		S2	G5	SC			Y
Carolina Anemone	Anemone caroliniana						1888			S1	G5	END			Y
Clustered Poppy-mallow	Callirhoe triangulata						1861			S2	G3	SC			Y
Clustered Sedge	Carex cumulata						1968			S2	G4?	SC			Y

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Dwarf Milkweed	Asclepias ovalifolia		2010							S3	G5?	THR			Y
Flat-stemmed Spike-rush	Eleocharis compressa							1884		S2	G4	SC			Y
Glade Fern	Diplazium pycnocarpon			1930		1916	2010			S2	G5	SC			Y
Great Water-leaf	Hydrophyllum appendiculatum						2011			S2S3	G5	SC			Y
Hooker's Orchid	Platanthera hookeri							1884		S2	G4	SC			Y
Lobed Spleenwort	Asplenium pinnatifidum							1990		S1	G4	THR			Y
Low Calamint	Calamintha arkansana						1911			S2	G5	SC			Y
Musk-root	Adoxa moschatellina						1936			S2	G5	THR			Y
Narrow-leaved Dayflower	Commelina erecta var. deamiana							1884		S1	G5T5	SC			Y
Northern Wild Monkshood	Aconitum noveboracense						2008			S2	G3	THR	LT		Y
One-flowered Broomrape	Orobanche uniflora						1931			S3	G5	SC			Y
Pale False Foxglove	Agalinis skinneriana									S2	G3G4	END			Y
Pale Green Orchid	Platanthera flava var. herbiola							1928		S2	G4T4Q	THR			Y
Pin Oak	Quercus palustris						1993			S1	G5	SC			Y
Pink Milkwort	Polygala incarnata							1914		S1	G5	END			Y
Prairie False-dandelion	Nothocalais cuspidata							1886		S2	G5	SC			Y
Prairie Fame-flower	Phemeranthus rugospermus							1991		S3	G3G4	SC			Y

		Planning Region													
		Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica						
Common Name	Scientific Name									State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Prairie Indian-Plantain	Cacalia tuberosa							1968		S3	G4G5	THR			Y
Prairie Parsley	Polytaenia nuttallii		1931				1931	1987		S2	G5	THR			Y
Prairie Turnip	Pedimelum esculentum							1989		S3	G5	SC			Y
Purple Milkweed	Asclepias purpurascens							1931	1931	S3	G5?	END			Y
Rock Clubmoss	Huperzia porophila						1980			S3	G4	SC			Y
Rock Stitchwort	Arenaria stricta ssp. dawsonensis						1958			S1	G5	SC			Y
Roundstem Foxglove	Agalinis gattingeri							1974		S2	G4	THR			Y
Short's Rock-cress	Arabis shortii						2011			S1S2	G5	SC			Y
Silky Prairie-clover	Dalea villosa var. villosa						1958			S2	G5	SC			Y
Small Forget-me-not	Myosotis laxa							1932		S2	G5	SC			Y
Small White Lady's-slipper	Cypripedium candidum	1885						1886		S3	G4	THR			Y
Smooth-sheath Sedge	Carex laevivaginata							1989		S1	G5	END			Y
Snowy Campion	Silene nivea						2011			S2	G4?	THR			Y
Twinleaf	Jeffersonia diphylla						2011	1991		S3	G5	SC			Y
Whip Nutrush	Scleria triglomerata		1916					1932		S2S3	G5	SC			Y
Wild Hyacinth	Camassia scilloides							1995		S2	G4G5	END			Y
Wild Licorice	Glycyrrhiza lepidota					1910				S1	G5	SC			Y
Woodland Bluegrass	Poa sylvestris						2011			S1	G5	SC			Y

		Planning Region													
Common Name	Scientific Name	Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Woolly Milkweed	Asclepias lanuginosa		1998							S1	G4?	THR			Y
Yellow Gentian	Gentiana alba						1986	2002		S4	G4	THR			Y
Yellow Giant Hyssop	Agastache nepetoides						1921	1993		S3	G5	THR			Y
Yellow Wild-indigo	Baptisia tinctoria								1986	S1	G5	SC			Y
Natural Communities															
Algific Talus Slope	Algific talus slope						2010			S1	G2	NA			Y
Cedar Glade	Cedar glade							1984		S4	GNR	NA			Y
Dry Cliff	Dry cliff	1976					2010	1984		S4	G4G5	NA			Y
Dry Prairie	Dry prairie						1981	1976		S3	G3	NA			Y
Emergent Marsh	Emergent marsh			1986			1977	1976		S4	G4	NA			Y
Floodplain Forest	Floodplain forest		2010	1986		1981	1977			S3	G3?	NA			Y
Hemlock Relict	Hemlock relict	1976								S2	G2Q	NA			Y
Moist Cliff	Moist cliff	1976					2011	1984		S4	GNR	NA			Y
Northern Dry-mesic Forest	Northern dry-mesic forest		1998							S3	G4	NA			Y
Oak Barrens	Oak barrens							2010		S2	G2?	NA			Y
Pine Barrens	Pine barrens		1998							S2	G2	NA			Y
Pine Relict	Pine relict							2011		S2	G4	NA			Y
Riverine Lake/Pond	Riverine Lake/Pond		1981							SU	GNR	NA			Y
Shrub-carr	Shrub-carr						1976	1976		S4	G5	NA			Y

		Planning Region													
		Baraboo/Dell Creek	Buffalo/Tremp/Beaver/Black	EauGalle/Hay/Red Cedar/Elk/Chippewa	Grant/Platte/Galena	Kinny/Rush/Trimbelle	Lax/Coon/Bad Axe/Kick	Lower Wis	Sugar/Pecatonica						
Common Name	Scientific Name									State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Southern Dry Forest	Southern dry forest						1981	2011		S3	G4	NA			Y
Southern Dry-mesic Forest	Southern dry-mesic forest						2011			S3	G4	NA			Y
Southern Mesic Forest	Southern mesic forest						2011	1976		S3	G3?	NA			Y
Southern Sedge Meadow	Southern sedge meadow							2010		S3	G4?	NA			Y
Stream--Fast, Hard, Cold	Stream--fast, hard, cold							1984		S4	GNR	NA			Y
Stream--Fast, Soft, Cold	Stream--fast, soft, cold		1981							SU	GNR	NA			Y
Stream--Slow, Hard, Cold	Stream--slow, hard, cold								1969	SU	GNR	NA			Y
Stream--Slow, Soft, Cold	Stream--slow, soft, cold		1982							SU	GNR	NA			Y

Appendix D

Summary Descriptions for Driftless Area Streams

The following paragraphs give brief summary descriptions for some of the rare species documented Driftless Area Streams properties and mapped in the NHI Database. More information can be found on the Endangered Resources Web site (www.dnr.wi.gov/org/land/er/) for several of these species.

Rare Animals

A Lepidostomatid Caddisfly

A Lepidostomatid Caddisfly, *Lepidostoma libum*, is a State Special Concern aquatic invertebrate. Caddisfly larvae occur most frequently in cool, slow-moving waters where detritus, or dead organic matter, collects. Lepidostomatid larvae use the accumulated plant matter, including twigs, pieces of bark, and leaves to build four-sided cases.

A Rhyacophilan Caddisfly

A Rhyacophilan caddisfly, *Rhyacophila vibox*, is a State Special Concern aquatic invertebrate that is most frequently found in lotic environments under rocks or in accumulated algae.

A Spiny Crawler Mayfly

A Spiny Crawler Mayfly, *Ephemerella excrucians*, is a State Special Concern aquatic invertebrate that is found in silt and sand at the bottom of streams and lakes. They consume floating detritus, dead organic matter, algae, and aquatic plants.

A Predaceous Diving Beetle

A Predaceous Diving Beetle, *Agabus confinis*, is a State Special Concern aquatic invertebrate that is found in small, cool pools, usually where the water is shaded by densely growing emergent plants such as sedges.

A Predaceous Diving Beetle

A Predaceous Diving Beetle, *Hydroporus pseudovilis*, is a State Special Concern aquatic invertebrate that is found in cold, spring-fed pools and creeks as well as among mosses that grow around the margins of springs.

A Water Scavenger Beetle

A Water Scavenger Beetle (*Cymbiodyta blanchardi*) is a State Special Concern beetle. Larvae burrows in substrate of spring fed seeps and streams.

A Water Scavenger Beetle

A Water Scavenger Beetle, *Cymbiodyta chamberlaini*, is a State Special Concern beetle.

A Water Scavenger Beetle

A water scavenger beetle (*Hydrochara spangleri*), a State Special Concern beetle, has been found in shallow floodplains of rivers.

A Water Scavenger Beetle

A water scavenging beetle (*Sperchopsis tessellatus*), a State Special Concern beetle, has been found in small, cool streams, usually with sand.

A Water Scavenger Beetle

A water scavenging beetle (*Hydrobius melaenum*), a State Special Concern beetle, has been found under banks of small, spring-fed streams.

Acadian Flycatcher

Acadian Flycatcher (*Empidonax virescens*), a State Threatened bird, prefers lowland deciduous forests and heavily wooded hillsides in large blocks of southern forests. Recommended avoidance period for this species is May 1 - August 31.

American Bullfrog

American Bullfrog (*Rana catesbeiana*), a State Special Concern frog, may be found throughout Wisconsin in any permanent body of water - lakes, ponds, rivers, and creeks, although they have a very patchy distribution. In Wisconsin, bullfrogs appear to favor oligotrophic to mesotrophic waters, often breeding where dense submergent vegetation filters out the majority of the suspended solids. Adult bullfrogs overwinter in water to avoid freezing. Bullfrogs are active from April through mid-October. They breed from mid-May through late July or later. Larvae overwinter before transforming the following year or, or in rare situations, in their second full year.

American Eel

American eel (*Anguilla rostrata*), a State Special Concern fish, prefers large streams, rivers and lakes with muddy bottoms and still waters. To reach these conditions the eel has to traverse a wide variety of less suitable habitat including swift-flowing waters with a wide variety of substrates. Spawning occurs in the Sargasso Sea.

Bald Eagle

Bald Eagle (*Haliaeetus leucocephalus*), a bird listed as Special Concern in Wisconsin and Federally protected by the Bald & Golden Eagle Protection Act, prefers large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. In southern Wisconsin, the recommended avoidance period extends from February 15 - July 1. In northern Wisconsin, the recommended avoidance period is from March 15 - August 1.

Bell's Vireo

Bell's Vireo (*Vireo bellii*), a bird listed as Threatened in Wisconsin, prefers dense shrubby areas within an open prairie landscape. The recommended avoidance period is from May 25 - August 15.

Big Brown Bat

The big brown bat (*Eptesicus fuscus*) is a Threatened species in Wisconsin. During the summer months, they are found in various habitats including mixed forest habitats of deciduous woodlands, farmlands, edge habitats near water, and in urban areas. During the winter months, they are found in natural and manmade structures like caves, mines, and basements. Primarily insectivores, the big brown bat feeds on flying insects and small beetles found among tree foliage. During the breeding season from mid-September to mid-October, 1-2 young are produced per litter with the young flying in 4-5 weeks.

Black-billed Cuckoo

Black-billed Cuckoo (*Coccyzus erythrophthalmus*) is a Special Concern species in Wisconsin. They typically nest in deciduous and mixed deciduous-coniferous woodlands near lakes or streams, and less often in coniferous forests. Their breeding season occurs from mid May to late August.

Black Buffalo

Black Buffalo (*Ictiobus niger*), a fish listed as Threatened in Wisconsin, prefers strong currents of large rivers, sloughs, backwaters and impoundments. Spawning occurs from April through mid-June.

Black Redhorse

Black Redhorse (*Moxostoma duquesnei*), a fish listed as Endangered in Wisconsin. In Wisconsin, the only known extant population is in the Wisconsin and Eau Claire Rivers near Wausau. It is found in clear water over gravel, bedrock, and sand where siltation is at a minimum. Spawning occurs from late May through early June.

Black Tern

Black Tern (*Chlidonias niger*), a bird listed as Special Concern, prefers large shallow marshes with abundant vegetation adjacent to open water. The recommended avoidance period is from May 15 to July 31.

Blanding's Turtle

Blanding's turtles (*Emydoidea blandingii*) are listed as a Threatened species in Wisconsin. They utilize a wide variety of aquatic habitats including deep and shallow marshes, shallow bays of lakes and impoundments where areas of dense emergent and submergent vegetation exists, sluggish streams, oxbows and other backwaters of rivers, drainage ditches (usually where wetlands have been drained), and sedge meadows and wet meadows adjacent to these habitats. This species is semi-terrestrial and individuals may spend a good deal of time on land. They often move between a variety of wetland types during the active season, which can extend from early March to mid-October. They overwinter in standing water that is typically more than 3 feet in deep and with a deep organic substrate but will also use both warm and cold-water streams and rivers where they can avoid freezing. Blanding's generally breed in spring, late summer or fall. Nesting occurs from about mid-May through June depending on spring temperatures. They strongly prefer to nest in sandy soils and may travel well over a mile to find suitable soils. This species appear to display nest site fidelity, returning to its natal site and then nesting in a similar location annually. Hatching occurs from early August through early September but hatchlings can successfully overwinter in the nest, emerging the following late April or May. This species takes 17 to 20 years or more to reach maturity.

Blue Sucker

Blue Sucker (*Cyprinostomus elongatus*), a fish listed as Threatened in Wisconsin, prefers large, deep rivers with moderate to strong currents over substrates of gravel or cobble. Spawning occurs from late April through early May.

Blue-winged Warbler

Blue-winged Warbler (*Vermivora pinus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers early- to mid-successional habitats with dense vegetation, especially young trees, shrubs, and thickets. Its nesting season occurs from early May to mid June.

Bobolink

Bobolink (*Dolichonyx oryzivorus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers open grasslands with a moderate litter layer and standing residual vegetation, including hay fields, pastures, idle grasslands, old fields, mesic prairies, and sedge meadows. Their breeding season occurs from mid May to mid July.

Bristled Slitmouth

Bristled slitmouth (*Stenotrema barbatum*) is a State Special Concern species of terrestrial snail.

Broad-banded Forestsnail

Broad-banded Forestsnail (*Allogona profunda*) is a State Special Concern species of terrestrial snail. In the Driftless Area of Wisconsin, these snails have been found in historic fire shadow zones, where they are protected by the rugged terrain. This larger-sized snail species is vulnerable to predation by rodents and insectivores that can negatively impact population density.

Brown Thrasher

Brown Thrasher (*Toxostoma rufum*) is a bird of Special Concern in Wisconsin. This species nests in hedgerows and in brushy edges of fields and forests. Breeding occurs from early May to mid July.

Buckhorn

Buckhorn (*Tritogonia verrucosa*), a mussel listed as Threatened in Wisconsin, is found in medium to large-sized rivers, with a moderate to swift current, and clean, firm substrates. The known host fish are yellow and brown bullheads and flathead catfish.

Butterfly

Butterfly (*Ellipsaria lineolata*), a mussel listed as Endangered in Wisconsin, is found in large rivers in the western and southern parts of the state. It prefers a stable substrate containing rock, gravel and sand in swift current. The known host species include three common fish; drum, green sunfish, and sauger.

Cerulean Warbler

Cerulean Warbler (*Dendroica cerulea*), a bird listed as Threatened in Wisconsin, prefers lowland deciduous forests dominated by mature stands of American elm, cottonwood, and green ash and large upland blocks of mature dry-mesic to mesic forests. The recommended avoidance period is from May 1 - August 24.

Cherrystone Drop

Cherrystone Drop (*Hendersonia occulta*) State Threatened, these terrestrial snails have a thick 6-8mm wide shell that is wider than it is high, usually reddish or yellowish in color, and lacks an opening in the center of the base of the shell. Inhabitants of small areas of algific habitat or the similar cool, moist, shaded sites of cliffs where algific conditions occur without substantial talus or ice. The species is most often found on wooded alluvial-soil banks and bluffs.

Clamp-tipped Emerald

Clamp-tipped Emerald (*Somatochlora tenebrosa*), a State Special Concern dragonfly, has been found in small forest streams with intermittent riffles and pools. The flight period is early July through mid-August.

Cyrano Darner

Cyrano darner (*Nasiaeschna pentacantha*), is a State Special Concern dragonfly. This southern species breeds in swampy warm streams and lake coves and ponds with roots or branches in the water. The flight period is from early June to early July.

Deer Mouse

The deer mouse (*Peromyscus maniculatus*) is a Special Concern species in Wisconsin. The habitat requirements for the deer mouse are quite diverse including grasslands, agricultural fields, mixed hardwood forests, and alpine regions.

Domed Disc

Domed disc (*Discus patulus*) is a terrestrial snail listed as Special Concern in Wisconsin. This species is found under logs and moist leaves in upland deciduous forests, ravines, and river valleys.

Dull Gloss

Dull Gloss, (*Zonitoides limatulus*), a terrestrial snail listed as Special Concern, has a dull whitish shell, which measures 4.3-5mm wide. It is often found in floodplain forests.

Eastern Pipistrelle

Eastern Pipistrelle, (*Perimyotis subflavus*), (formerly *Pipistrellus subflavus*), a mammal listed as Special Concern, is usually a yellowish color, but it may vary from black, chocolate brown, silvery gray, or pale yellow to almost orange. Its individual hairs are actually tri-colored. This species typically roosts in caves for hibernation, and does so singly or in small groups. While little is known for certain about their daytime and summer roosts, they have been found in trees and tree foliage. For foraging, Eastern pipistrelles prefer habitat such as forest edges and waterways. Most mating occurs in the fall, with delayed fertilization and twin pups born in spring.

Eastern Red Bat

The eastern red bat (*Lasiurus borealis*) is a Special Concern species in Wisconsin. During both summer and winter, they are found in various forested habitats, often near trails, fields, and wetlands. The breeding season lasts from early-August to the end of September.

Elephant Ear

Elephant Ear (*Elliptio crassidens*), a mussel listed as Endangered in Wisconsin, is found in large rivers in the western part of the state. Only very old relic individuals have been found since 1920. The only known host is the skipjack herring, which only very rarely occurs in the upper Mississippi River and its tributaries.

Fawnsfoot

Fawnsfoot (*Truncilla donaciformis*) a State Special Concern Species, prefers large rivers or the lower reaches of medium-sized streams. It is most commonly found in sand or gravel. Once widespread and abundant, this species is rarely found in recent years. Known fish hosts are freshwater drum and sauger.

Four-toed Salamander

Four-toed salamanders (*Hemidactylium scutatum*), a species of special concern, prefer northern and southern hardwood forests and to a lesser degree, conifer swamps. They overwinter from November through late March by burrowing underground to avoid freezing. Mating can occur in fall or spring at breeding ponds, seepage pools or springs. In April, females move to microhabitats of dense, usually sphagnum, mosses overhanging the water's edge or dense mosses on downed woody debris overlying the water. Four-toed salamanders will also nest in inundated sedge tussock wetlands when mosses are not present. This species' unique nesting microhabitats appear to limit their abundance. Females remain with their eggs until hatching. Eggs hatch in late May or June and larvae drop into the water where they live until transforming in about six weeks. Four-toed salamanders remain active through November.

Golden-winged Warbler

Golden-winged Warbler (*Vermivora chrysoptera*) is a Special Concern species in Wisconsin. Although associated with early-successional habitats, this species requires a diverse landscape mosaic of habitat types to fulfill all of its life history needs. This habitat mosaic includes brushy forest openings, shrubby wetlands, or brushy grasslands and adjacent areas of more mature forest. This species will build their well-concealed nests on the ground. Nesting occurs from late May to late July.

Goldeye

Goldeye (*Hiodon alosoides*), a fish listed as Endangered in Wisconsin, prefers the quiet, turbid waters of large rivers and their connecting lakes ponds and marshes. Spawning occurs from May through early July.

Gophersnake

Gophersnake (*Pituophis catenifer*), a species of Special Concern and a Protected Wild Animal, prefer sand prairies, bluff prairies, oak savannas and pine and oak barrens. Overwintering can occur in sand prairies, where they often den singly by using mammal burrows or other structures to get below the frost line or they may den communally using deep rock fissures on southerly exposed bluff prairies. This species is active from late March through early October, breeds mid-April through May and lays it's eggs in sand cavities they create or under large flat rocks in late June to early July. The eggs hatch in late August to early September.

Grasshopper Sparrow

Grasshopper Sparrow (*Ammodramus savannarum*), a bird listed as Special Concern, prefers prairies, retired cropland, unmowed highway right-of-ways, pastures (Kentucky bluegrass and timothy), shrub-carr wetlands, northern sedge meadows, and managed grasslands maintained for duck production. This bird will nest in areas of 5-25 cm height-density that has bare patches and a diverse structure with stiff forbs for song perches. The recommended avoidance period is from early May through mid-August.

Gray Ratsnake

Gray ratsnakes (*Pantherophis spiloides*) are a species of Special Concern and a Protected Wild Animal. They prefer savanna and oak forest habitats in southwestern Wisconsin and are known to communally overwinter with other bluff prairie species. This snake spends a lot of time in trees where it forages on cavity nesting birds and small rodents. It will often move into barns and other outbuildings in June during the sparrow and swallow nesting season. Gray ratsnakes are active from April through early October, breed from mid-May to early June and lay their eggs in mid- to late July, the latest egg-laying snake in Wisconsin. The young hatch in September, shortly before overwintering.

Gray Wolf

Gray Wolf (*Canis lupus*), also referred to as timber wolf, was removed from the federal threatened and endangered species list in January 2011. It is a Wisconsin Special Concern species and is on the state list of Protected Wild Animals (Wis. Admin. Code NR 10.02). Gray wolves are social animals, living in a family group, or pack. Pack sizes in Wisconsin average 2-6 individuals, with a few packs as large as 10-12 animals. A territory represents the geographic extent that a particular wolf pack will utilize in search of food and shelter. A wolf pack's territory may cover 20-80 square miles.

Greater Redhorse

Greater Redhorse (*Moxostoma valenciennesi*), a fish listed as Threatened in Wisconsin, This species prefers clear water of medium to large rivers, over bottoms of sand, gravel, or boulders. Spawning occurs in May or June.

Henslow's Sparrow

Henslow's Sparrow (*Ammodramus henslowii*) a bird listed as Threatened in Wisconsin, prefers old fields, open grasslands, wet meadows, unmowed highway right-of-ways, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds. The recommended avoidance period is from May 20 - August 15.

Higgin's Eye

Higgin's Eye (*Lampsilis higginsii*), a mussel listed as Endangered at the Federal and State level, is found in large rivers in the western part of the state. It is found in flowing waters with various stable substrate types but seems to prefer stable sand. Several common fish species have been recorded as its host, including drum, large and small mouth bass, walleye, and sauger.

Hoary Bat

The hoary bat (*Lasiurus cinereus*) is a Special Concern species in Wisconsin. This species typically roosts in coniferous and mixed hardwood forests, but has also been found in trees along urban streets and city parks. The breeding season occurs from mid-August to mid-October.

Hooded Warbler

Hooded Warbler (*Wilsonia citrina*), a bird listed as Threatened in Wisconsin. This species is found in large upland forest tracts in southern Wisconsin, where they occur in pockets of dense understory near small or partial canopy openings. The recommended avoidance period is from May 1 - August 15.

Kentucky Warbler

Kentucky Warbler (*Oporornis formosus*), a bird listed as Threatened in Wisconsin. This species is found in large tracts of hardwood forest in southern Wisconsin, especially along Mississippi and Wisconsin rivers and their bluffs, and the Baraboo Hills. They breed in sites that are moist, with heavy undergrowth, thickets and ground vegetation. The recommended avoidance period is from May 16 - August 15.

Lake Sturgeon

Lake Sturgeon (*Acipenser fulvescens*), a fish listed as Special Concern, prefers large rivers and lakes. It also lives in the shoal waters of the Great Lakes. Inland it shows a preference for the deepest mid-river areas and pools. Spawning occurs from late April through early June in cold, shallow fast water.

Lark Sparrow

Lark Sparrow (*Chondestes grammacus*), a bird listed as Special Concern, prefers old field, prairie and upland shrub-carr areas. The recommended avoidance period is from May 10 - September 25.

Least Flycatcher

The Least Flycatcher (*Empidonax minimus*) is a State Special Concern species that is found in almost every major type of deciduous and mixed forest, although less commonly in conifers. Although Least Flycatcher historically bred throughout Wisconsin, the breeding range shifted mostly to the northern part of the state as deciduous forest cover was lost in the south. Nesting occurs from mid-May to mid-July.

Little Brown Bat

The little brown bat (*Myotis lucifugus*) is a Threatened species in Wisconsin. This species is found in various habitats such as caves, hollow trees, abandoned mines, and buildings. The breeding season lasts from late-August to the end of October.

Louisiana Waterthrush

Louisiana Waterthrush (*Seiurus motacilla*), a bird of Special Concern in Wisconsin. This species breeds along rocky streams in relatively large, intact deciduous or mixed forest in the southern 2/3 of the state, and sometimes into floodplain forest where streams enter. The recommended avoidance period is from April 16 - July 15.

Monkeyface

Monkeyface (*Quadrula metanevra*), a mussel listed as Threatened, is found in the western part of the state in swift, clean water in larger rivers in gravel or mixed sand and gravel. Three common host fishes have been reported: bluegill, green sunfish, and sauger.

Mud Darter

Mud Darter (*Etheostoma asprigene*), a fish listed as Special Concern, prefers moderate currents in sloughs, overflow areas, riffles, and pools of large, low-gradient rivers over bottoms of mud, sand, gravel, clay, or bedrock. Spawning occurs from mid-May through June.

Northern Cricket Frog

Northern Cricket Frog (*Acris crepitans*), an endangered species in Wisconsin, prefer ponds, lakes, and a variety of habitats along and adjacent to streams and rivers including, marshes, fens, sedge meadows, low prairies, and exposed mud flats. The species tends to breed in quite water (no or low flow) and may also move from streams and rivers to adjacent wetlands and ponds. Cricket frogs cannot tolerate freezing or complete inundation for more than 24 hours during the winter and seek a variety of microhabitats that provide suitable overwintering conditions, including crayfish burrows, small mammal burrows, rotted-out root channels, seepage areas where groundwater flow prevents freezing at the surface or spaces created by sloughing streambanks. Cricket frogs are active from late-March through November. Breeding occurs from mid-May through mid-August, with some larvae not transforming until late September.

Northern Harrier

Northern Harrier (*Circus cyaneus*), a bird listed as Special Concern, prefer retired cropland (timothy/quackgrass), old field habitat, sedge meadow, and restored prairies. The recommended avoidance period is from early April through late August.

Northern Leopard Frog

The Northern Leopard Frog (*Lithobates pipiens*), a State Special Concern species, breeds in a wide variety of wetlands, especially in those where fish are absent. They may forage far from water in old fields and prairies. Northern Leopard frogs breed from late March to early June, laying their eggs in clusters on submerged vegetation. Hatching occurs after 1 to 3 weeks, varying with water temperature, and metamorphosis occurs after 70 to 110 days as a tadpole.

Northern Long-eared Bat

Northern Long-eared Bat, (*Myotis septentrionalis*), a mammal listed as Special Concern, is usually dull light brown, with a gray underbelly. Habitat for the summer may include day roosts in buildings, under tree bark or shutters, or caves during the night. Hibernation sites are often in mines or caves, and this species may co-hibernate with other species. Foraging habitat includes forested hillsides and ridges, and small ponds or streams. Mating occurs in the fall with delayed fertilization in the spring, and one young produced between May and July.

Ornate Box Turtle

Ornate box turtles (*Terrapene ornata*), listed as Endangered in Wisconsin, prefer dry sand prairies, oak savannas with sandy soils and in sandy open oak woods. They overwinter in deep sand in open canopy habitat in microhabitats supporting sparse vegetation and in areas of disturbed soils such as the edges of sand blows. Ornates are active from late-March or early April through mid-October. Breeding primarily occurs in August but can happen throughout the active season. Nesting occurs from late-May through early July and hatching occurs in August or early September. Hatchlings may remain in nests and emerge the following spring.

Ozark Minnow

Ozark Minnow (*Notropis nubilus*), a fish listed as Threatened in Wisconsin, prefers clear, small to medium, low-gradient streams over bottoms of cobble. Spawning occurs from May through early August.

Paddlefish

Paddlefish (*Polyodon spathula*), listed as a Threatened Species in Wisconsin, prefers large rivers and their lakes. They spawn over mud or gravel in early spring during high flows.

Pallid Shiner

Pallid Shiner (*Notropis amnis*), a fish listed as Endangered in Wisconsin, prefers the quiet to sluggish flows of large lowland rivers and their sloughs and impoundments, over substrates of sand or mud. Spawning occurs from late March into April at around 10 degrees Celsius with rising water levels.

Pickerel Frog

Pickerel frogs (*Lithobates palustris*) are a Species of Special Concern in Wisconsin. It has a rather complex habitat range as it prefers to overwinter in cold water streams, seepage pools or spring holes, often taking advantage of water cress for cover. It moves to warmer water ponds to breed and lay eggs from April through mid-June. Adults spend most of the active season foraging on land in riparian habitats along streams and rivers. This species is active from late March to early November but can remain semi-active in winter under water. Larvae metamorphose from mid-July to mid-August.

Pirate Perch

Pirate Perch (*Aphredoderus sayanus*), a fish listed as Special Concern, prefers the quiet waters of oxbows, overflow ponds, sloughs, marshes, ditches, and the pools of medium to large rivers. The bodies of water often traversed are sand covered or soft muck bottoms, with organic debris present. Spawning occurs during May.

Plains Gartersnake

Plains gartersnakes (*Thamnophis radix*) are a Species of Special Concern in Wisconsin and prefer almost any open-canopy wetland type (not open water) and adjacent open to semi-open canopy upland, including prairies, old fields and weedy vacant lots. They also prefer low-canopy vegetation (<24"), although they will occupy habitats with taller vegetation such as reed canary grass. This species can be active from mid-March through early November, usually emerging shortly after frost-out and remaining active until daytime temperatures fall consistently below 500 F. Breeding usually occurs in April or early May but can occur in fall and live young are born between mid-July and mid-August.

Pugnose Minnow

Pugnose Minnow (*Opsopoeodus (Notropis) emiliae*), a fish listed as Special Concern, prefers quiet, weedy lakes, sloughs, and low-gradient rivers over bottoms of mud, sand, rubble, silt, or clay. Spawning occurs from mid-June through mid-July.

Quadrat Sallfly

Quadrat sallfly (*Haploperla orpha*) is a State Special Concern aquatic invertebrate. Quadrat sallfly nymphs can typically be found in medium and small sized streams.

Redfin Shiner

Redfin Shiner (*Lythrurus umbratilis*), a fish listed as Threatened in Wisconsin, prefers turbid waters of pools in low-gradient streams over substrates of boulders, cobble, sand, silt or detritus. Spawning occurs from early June through mid-August in sunfish nests and they coexist with the sunfish in the nesting territory.

Red-headed Woodpecker

The Red-headed Woodpecker (*Melanerpes erythrocephalus*) inhabits a wide variety of habitats, including deciduous woodlands (both upland and wetland), oak savanna, and other open upland sites with scattered trees. They typically nest in dead trees or dead limbs of live trees, but also use natural cavities. Preferred nest trees vary from 1-3 feet DBH (diameter at breast height). Nesting occurs from mid-May to early June.

Redside Dace

Redside Dace (*Clinostomus elongatus*), a fish listed as Special Concern, prefers cool water pools and quiet riffles of small streams (usually adjacent to meadows or pastures) with substrate of cobble, sand, clay silt or bedrock. Spawning occurs from May to early June.

Red-shouldered Hawk

Red-shouldered Hawk (*Buteo lineatus*), a bird listed as Threatened in Wisconsin. This species prefers larger stands of medium-aged to mature lowland deciduous forests, dry-mesic and mesic forest with small wetland pockets. The recommended avoidance period is from March 1 - July 31.

Ribbed Striate

Ribbed striate (*Striatura exigua*) is a terrestrial snail that is listed as Special Concern in Wisconsin.

River Redhorse

River Redhorse (*Moxostoma carinatum*), a fish listed as Threatened in Wisconsin, prefers moderate to swift currents in large rivers systems, including impoundments and pools. River bottoms of clean gravel are preferred. Spawning occurs from mid May through June when water temperatures reach 68 to 74 degrees Fahrenheit.

Rock Pocketbook

Rock Pocketbook (*Arcidens confragosus*), a mussel listed as Threatened in Wisconsin, is found in large rivers in the western part of the state. It is found in all substrate types where there is current. Five fish species have been recorded as its host including eel, drum, shad, rockbass and crappie.

Russet-tipped Clubtail

Russet-tipped clubtail (*Stylurus plagiatus*), a State Special Concern dragonfly has been found in medium to large turbid rivers with sand or silt bottoms. The flight period extends from late June through mid-August.

Sand Snaketail

Sand snaketail (*Ophiogomphus smithi*), a State Special Concern dragonfly, has been found in small to medium clean, fast-flowing sandy warm streams. The flight period extends from late May through mid June.

Shoal Chub

Shoal Chub (*Macrhybopsis (Hybopsis) aestivalis*), a fish listed as Threatened in Wisconsin, prefers fast, moderate depth water over broad sand flats. Spawning occurs from May through June, sporadic in August.

Silver Chub

Silver Chub (*Macrhybopsis (Hybopsis) storeriana*), a fish listed as Special Concern, prefers large, low gradient rivers. This species is found in moderate to strong currents, riffles, pools and sloughs with or without vegetation over substrates of sand, mud, silt or gravel. Spawning occurs in June and July.

Silver-haired Bat

The silver-haired bat (*Lasionycteris noctivagans*) is a Special Concern species in Wisconsin. During the summer months, silver-haired bats are found in forested habitats, particularly coniferous woodlands, often adjacent to aquatic habitats like ponds, lakes, and streams. During the winter months, they are found hibernating in trees, rock crevices, and buildings. The breeding season is short, lasting from late-August to the end of September.

Skipjack Herring

Skipjack Herring (*Alosa chrysochloris*), a fish listed as Endangered in Wisconsin, prefers open water, larger river lakes and channels below dams. They may congregate in swift currents below dams early in the year. This species have been caught in nearshore areas of Lake Michigan and Green Bay. Spawning does not occur in Wisconsin waters.

Slender Bluet

Slender Bluet (*Enallagma traviatum*), a State Special Concern damselfly usually found in permanent lakes and ponds with abundant emergent vegetation.

Slender Glass Lizard

[Western] slender glass lizards (*Ophisaurus attenuatus*), listed as Endangered in Wisconsin, prefer sandy oak savannas, sand prairies, old fields with sandy soils, and woodland edges around and within all of these habitats. Glass lizards overwinter in burrows they create by forcing their bodies through loose sandy soils. This lizard is active from mid-April through September. Breeding occurs in May and eggs are deposited from late June to early July and hatch in August.

Smoky Shadowfly

Smoky Shadowfly (*Neurocordulia molesta*), a State Special Concern dragonfly, has been found in rocky segments of medium to large rivers. The flight period is from late May to early July.

Smooth Coil

Smooth Coil, (*Helicodiscus singleyanus*), a terrestrial snail listed as Special Concern, has a faintly yellow shell that is 2-3mm wide. It prefers open, grassy places, along roadsides and railroads, and meadows as its habitat.

Starhead Topminnow

Starhead Topminnow (*Fundulus dispar*), a fish listed as Endangered in Wisconsin, prefers quiet, clear-slightly turbid, shallow backwaters with an abundance of submerged aquatic plants. Spawning occurs from June through July.

Timber Rattlesnakes

Timber rattlesnakes (*Crotalus horridus*) are a species of Special Concern and a Protected Wild Animal. Adult males and non-gravid adult females prefer deciduous forests and woodland edges in an agricultural setting during the summer. Gravid females and juvenile timbers prefer to remain in open-canopy bluff prairies during the summer because of higher preferred body temperatures, but avoid overheating by taking advantage of various structures to provide shade, such as brush, trees or rock shelves. Timbers emerge from hibernation as early as mid-April but may continue to emerge well into June. They remain

active until as late as mid-October, with the females that give birth in a given year remaining active longer than other individuals. Timbers primarily breed in August and females give birth the following mid-August or mid-September. Individual females in WI usually produce young only once every three to four years.

Veery

Veery (*Catharus fuscescens*) is a State Special Concern bird that utilizes a variety of forest habitats. This area-sensitive species is able to use a wide variety of mesic to wet forest cover types and successional stages provided that there is thick deciduous undergrowth present. Nesting occurs from late May to early July.

Vesper Sparrow

The Vesper Sparrow (*Pooecetes gramineus*) is a Special Concern species in Wisconsin. It prefers dry, open habitats with short, sparse vegetation, some bare ground, and short to moderate shrub or tall forb cover. In Wisconsin, this includes Dry to Dry-mesic Prairie, short to medium height idle grasslands, shrubby grasslands, dry old fields, pastures, hay fields, small grain fields, weedy fence lines and roadsides, orchards, woodland edges, and shelterbelts. Nesting occurs from late April to mid-July.

Wartyback

Wartyback (*Quadrula nodulata*), a mussel listed as Threatened in Wisconsin, is found in large rivers in sand, mud, or fine gravel. It can be locally common. Six common host fishes have been reported, including crappie, bluegill, catfish, and bass species.

Washboard

Washboard (*Megaloniaias nervosa*), a State Special Concern mussel. This species is found in the western part of the state in large rivers with moderate current. Although it has been found in various substrate types, it seems to be most abundant in stable mud. A number of common fish species have been recorded as its host (eel, catfish, centrarchids, bowfin and bass).

Water Shrew

Water Shrew (*Sorex palustris*), a state Special Concern mammal. This species is found in marshes, bogs, and cold, small streams with cover along the banks.

Weed Shiner

Weed Shiner (*Notropis texanus*), a fish listed as Special Concern, prefers sloughs, lakes, and still to sluggish sections of medium streams to large rivers, over substrates of sand, mud, clay, silt, detritus, gravel or boulders. Spawning occurs from late June through July at approximately 18 degrees Celsius.

Western Sand Darter

Western Sand Darter (*Etheostoma clarum*), a fish listed as Special Concern, prefers clear to slightly turbid waters with moderate to strong currents. They are often found in medium to large rivers over extensive sand flats. Spawning occurs from late June through July.

Willow Flycatcher

Willow Flycatcher (*Empidonax traillii*) is a Special Concern species that prefers shrubby wetlands and uplands. They commonly nest in elderberry, dogwood, honeysuckle, and willow, which are often placed over water. Nesting occurs from early June to early July.

Wood Thrush

The Wood Thrush (*Hylocichla mustelina*) is a Special Concern species that prefers large blocks of upland moist forests with mature trees, moderate to dense canopy cover, moderate undergrowth, and ample leaf litter. Nesting occurs from mid-May to late July.

Wood Turtle

Wood turtles (*Clemmys insculpta*), a Threatened species in Wisconsin, prefer clean rivers and streams with moderate to fast flows and adjacent riparian wetlands and upland deciduous forests. This species often forages in open wet meadows or in shrub-carr habitats dominated by speckled alder. They overwinter in streams and rivers in deep holes or undercut banks where there is enough water flow to prevent freezing. This semi-terrestrial species tends to stay within about 300 meters of rivers and streams but exceptions certainly occur, especially within the driftless area of southwestern and western Wisconsin. This species becomes active in spring as soon as the ice is gone and air temperatures reach around 50 degrees in March or April. They can remain active into mid-October but have been seen breeding under the ice. Wood turtles can breed at any time of year, but primarily during the spring or fall. Nesting usually begins in late May in northern WI and early June in southern WI and continues through June. This species nests in sand or gravel, usually very close to the water, although it is known to nest along sand and gravel roads or in abandoned gravel pits some distance from water. Hatching occurs in 55-75 days (August) depending on air temperatures. This species does not overwinter in nests, unlike other WI turtles.

Wood Thrush

The Wood Thrush (*Hylocichla mustelina*) is a Special Concern species that prefers large blocks of upland moist forests with mature trees, moderate to dense canopy cover, moderate undergrowth, and ample leaf litter. Nesting occurs from mid-May to late July.

Yellow-billed Cuckoo

The Yellow-billed Cuckoo (*Coccyzus americanus*) is a Special Concern species that prefers forested uplands and wetlands, oak woodlands, Shrub-carr, shrubby woodland edges, and dense willow or dogwood thickets, often near streams or lakes. Nesting occurs from late May to early August.

Yellow & Slough Sandshell

Yellow sandshell (*Lampsilis teres anodontoides*) and slough sandshell (*Lampsilis teres teres*) are subspecies of *Lampsilis teres* which is listed as Endangered in Wisconsin. They are found in large rivers in the western part of the state. The yellow sandshell occurs in swift currents in clean swept sandy areas in the main channel. Eight fish species have been recorded as its host, including gars, basses, sturgeon and centrarchid species. The slough sandshell occurs in muddy areas adjacent to the current of large rivers. Three fish species have been recorded as its host, including gar species.

Rare Plants

American Feverfew

American Feverfew (*Parthenium integrifolium*), a State Threatened plant, is found in prairies and remnants along roads and railroads. It is sometimes planted and it can be difficult to tell whether a native plant is present. Blooming occurs late June through early September; fruiting occurs early August through early October. The optimal identification period for this species is late July through late September.

Broad Beech Fern

Broad Beech Fern (*Phegopteris hexagonoptera*), a State Special Concern plant, is found in rich hardwood or mixed conifer-hardwood forests. The optimal identification period for this species is late May through late September.

Butternut

Butternut (*Juglans cinerea*) a "Watch" species in Wisconsin, is found in both lowland and upland forests. This tree is susceptible to butternut canker (*Sirococcus clavigignenti-juglandacearum*), a lethal fungal disease of unknown origin.

Carolina Anemone

Carolina Anemone (*Anemone caroliniana*), a State Endangered plant, is found in dry bluff and sand prairies and gravelly hillsides, mostly near the Mississippi and lower Chippewa Rivers. Blooming occurs early Apr. through late May; fruiting occurs late May through late June. The optimal identification period for this species is throughout May.

Clustered Poppy-mallow

Clustered Poppy-mallow (*Callirhoe triangulata*), a State Special Concern plant, is found in sand terrace prairies. Blooming occurs early July through late September; fruiting occurs early August through late September. The optimal identification period for this species is early July through late September.

Clustered Sedge

Clustered Sedge (*Carex cumulata*), a State Special Concern plant, is found in disturbed areas in barrens areas of Glacial Lake Wisconsin, including borrow pits, roadsides, sphagnum boggy woods, wooded sandstone bluff tops. Blooming occurs throughout June; fruiting occurs early July through early September. The optimal identification period for this species is early July through late August.

Dwarf Milkweed

Dwarf Milkweed (*Asclepias ovalifolia*), a State Threatened plant, is found in periodically brushed areas, rights-of-way. Blooming occurs early June through early July; fruiting occurs late June through late August. The optimal identification period for this species is throughout June.

Flat-stemmed Spike-rush

Flat-stemmed Spike-rush (*Eleocharis compressa*), a State Special Concern plant, is found in moist to wet, often calcareous prairies and mud flats. Blooming occurs early May through early June; fruiting occurs late June through late July. The optimal identification period for this species is late June through late July.

Glade Fern

Glade Fern (*Diplazium pycnocarpon*), a State Special Concern plant, is found in very rich mesic deciduous forests, often with dolomite near the surface. This species can be identified year-round.

Glade Mallow

Glade Mallow (*Napaea dioica*), a State Special Concern plant, is found in alluvial meadows, ditches, and forest margins near large rivers. Blooming occurs early June through early August; fruiting occurs early August through late September. The optimal identification period for this species is early July through late August.

Great Indian-plantain

Great Indian-plantain (*Cacalia muehlenbergii*), a State Special Concern plant, is found in mesic hardwood forests and adjacent mesic prairies, often with dolomite near the surface. Blooming occurs late June through late July; fruiting occurs late July through late August. The optimal identification period for this species is early June through late September.

Great Water-leaf

Great Water-leaf (*Hydrophyllum appendiculatum*), a State Special Concern plant, is found in rich moist woods. Blooming occurs from May through June. The optimal identification period for this species is May through June.

Hooker's Orchid

Hooker's Orchid (*Platanthera hookeri*), a State Special Concern plant, is found in a variety of dry to moist, mostly mixed coniferous-hardwood forests. Blooming occurs late May through late July; fruiting occurs early July through late August. The optimal identification period for this species is early June through early September.

Lobed Spleenwort

Lobed Spleenwort (*Asplenium pinnatifidum*), a State Threatened plant, is found in crevices in dry sandstone cliffs. This species can be identified year-round.

Low Calamint

Low Calamint (*Calamintha arkansana*), a State Special Concern plant, is found most typically on wet dolomite flats on Lake Michigan (Door County), as well as fens and wet prairies. Blooming occurs late June through late September; fruiting occurs late July through late September. The optimal identification period for this species is early July through late August.

Musk-root

Musk-root (*Adoxa moschatellina*), a State Threatened plant, is found on moist shaded ledges and bare soil at cliff bases with relict northern plant species present. It is usually on or at the base of north-facing sandstone or limestone bluffs and talus slopes. Blooming occurs early May through late June; fruiting occurs early June through late July. The optimal identification period for this species is late May through late June.

Narrow-leaved Dayflower

Narrow-leaved Dayflower (*Commelina erecta* var. *deamiana*), a State Special Concern plant, is found in sand prairies and on sandstone outcrops, mostly along the lower Wisconsin River. Blooming occurs late June through early September; fruiting occurs late August through late September. The optimal identification period for this species is late June through early September.

Northern Wild Monkshood

Northern Wild Monkshood (*Aconitum noveboracense*), a State Threatened and Federally Threatened plant, is found on moist, moss ledges and cliff bases with cold air drainage resulting in a cool soil environment, as well as partially shaded sandstone cliffs and talus slopes. Blooming occurs late June through late September (peaks in August); fruiting occurs early August through late September. The optimal identification period for this species is late June through late September.

One-flowered Broomrape

One-flowered Broomrape (*Orobanche uniflora*), a State Special Concern plant, is found in sandy prairies, thickets, moist woods, and on streambanks. Blooming occurs from April through June. The optimal identification period for this species is mid April through late June.

Pale False Foxglove

Pale False Foxglove (*Agalinis skinneriana*), a State Endangered plant, is found in dry and calcareous prairies, woods, and barrens. Blooming occurs late July through early September; fruiting occurs early September through late October. The optimal identification period for this species is late July through early September.

Pale Green Orchid

Pale Green Orchid (*Platanthera flava* var. *herbiola*), a State Threatened plant, is found in moist prairies, sedge meadows, shrub-carrs, alder thickets, fen and bog mats, conifer swamp margins, and ditches. Its habitat is varied and difficult to characterize. Blooming occurs early June through early August; fruiting occurs early July through late August. The optimal identification period for this species is late June through early August.

Pin Oak

Pin Oak (*Quercus palustris*), a State Special Concern plant, is found in southern floodplain forests. Blooming occurs throughout May; fruiting occurs late July through early September. The optimal identification period for this species is late May through late September.

Pink Milkwort

Pink Milkwort (*Polygala incarnata*), a State Endangered plant, is found in moist- to dry-mesic prairies. Blooming occurs early July through early August; fruiting occurs early August through early November. The optimal identification period for this species is early August through early November.

Prairie False-dandelion

Prairie False-dandelion (*Nothocalais cuspidata*), a State Special Concern plant, is found on dry, rock prairie bluffs and gravelly hillsides. Blooming occurs early May through early June; fruiting occurs late May through late June. The optimal identification period for this species is early May through early June.

Prairie Fame-flower

Prairie Fame-flower (*Phemeranthus rugospermus*), a State Special Concern plant, is found in open sandy prairies in barrens, often where there is little competition from other forbs. Blooming occurs late June through early August; fruiting occurs early July through early September. The optimal identification period for this species is early July through late August.

Prairie Indian-Plantain

Prairie Indian-Plantain (*Cacalia tuberosa*), a State Threatened plant, is found in a variety of deep-soiled prairies. Blooming occurs early May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late July.

Prairie Parsley

Prairie Parsley (*Polytaenia nuttallii*), a State Threatened plant, is found in prairies and persisting in open areas that were savannas. Blooming occurs early May through late June; fruiting occurs late June through late August. The optimal identification period for this species is early May through late August.

Prairie Ragwort

Prairie Ragwort (*Senecio plattensis*), a State Special Concern plant, is found in dry prairies. Blooming occurs late May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late June.

Prairie Turnip

Prairie Turnip (*Pedimelum esculentum*), a State Special Concern plant, is found in dry prairies, especially on dolomitic hillsides near oak woodland margins. Blooming occurs late May through late July; fruiting occurs early July through late August. The optimal identification period for this species is early June through late August.

Purple Milkweed

Purple Milkweed (*Asclepias purpurascens*), a State Endangered plant, is found in open oak forest margins and roadsides; it has wide soil moisture tolerances. Blooming occurs early June through late July; fruiting occurs early July through late August. The optimal identification period for this species is late June through late July.

Rock Clubmoss

Rock Clubmoss (*Huperzia porophila*), a State Special Concern plant, is found on moist shaded cliffs in mixed conifer-hardwood forests. This species can be identified year-round.

Rock Stitchwort

Rock Stitchwort (*Arenaria stricta* ssp. *dawsonensis*), a State Special Concern plant, is found on dolomite and sandstone ledges and dry prairies. Blooming occurs early June through early July; fruiting occurs early July through early September. The optimal identification period for this species is early July through early September.

Roundstem Foxglove

Roundstem Foxglove (*Agalinis gattereri*), a State Threatened plant, is found in dry open woodlands, prairies, and sandstone outcrops. Blooming occurs late June through late September; fruiting occurs early August through late September. The optimal identification period for this species is early August through late September.

Shadowy Goldenrod

Shadowy Goldenrod (*Solidago sciaphila*), a State Special Concern plant, is found on dry sandstone bluff edges, often under pines and Hill's oak. Blooming occurs late August through late September; fruiting occurs throughout September. The optimal identification period for this species is throughout September.

Short's Rock-cress

Short's Rock-cress (*Arabis shortii*), a State Special Concern plant, is found in mesic alluvial floodplain forests. Blooming occurs throughout May; fruiting occurs throughout June. The optimal identification period for this species is early May through early June.

Silky Prairie-clover

Silky Prairie-clover (*Dalea villosa* var. *villosa*), a State Special Concern plant, is found on dry sandy river terraces and hillside prairies (often being invaded by red cedar) near the St. Croix and Mississippi Rivers. Blooming occurs late July through early September; fruiting occurs throughout September. The optimal identification period for this species is early August through late September.

Small Forget-me-not

Small Forget-me-not (*Myosotis laxa*), a State Special Concern plant, is found in cold, clear forested streams. Blooming occurs early July through early August; fruiting occurs late July through late September. The optimal identification period for this species is early July through early September.

Small White Lady's-slipper

Small White Lady's-slipper (*Cypripedium candidum*), a State Threatened plant, is found in calcareous fens and prairies. Blooming occurs late May through early June; fruiting occurs throughout September. The optimal identification period for this species is late May through early June.

Smooth-sheath Sedge

Smooth-sheath Sedge (*Carex laevivaginata*), a State Endangered plant, is found in deciduous river bottoms, sloughs, and seeps with wet or inundated soils. It has also been found in sedge meadows, near seeps. Blooming occurs throughout June; fruiting occurs throughout July. The optimal identification period for this species is late June through early July.

Snowy Campion

Snowy Campion (*Silene nivea*), a State Threatened plant, is found on alluvial deciduous forest margins and meadows. Blooming occurs late June through late July; fruiting occurs early July through late August. The optimal identification period for this species is late June through late July.

Twinleaf

Twinleaf (*Jeffersonia diphylla*), a State Special Concern plant, is found in very rich hardwood forests, often with dolomite near the surface. Blooming occurs throughout May; fruiting occurs early July through early September. The optimal identification period for this species is early May through early June.

Violet Bush-clover

Violet Bush-clover (*Lespedeza violacea*), a State Special Concern plant, is found in dry forests and woodlands, usually on sandstone bluffs. Blooming occurs late June through late July; fruiting occurs late July through late September. The optimal identification period for this species is early July through early September.

Whip Nutrush

Whip Nutrush (*Scleria triglomerata*), a State Special Concern plant, is found on the sunny margins between jack pine/Hill's oak barrens and wet acid ditches with coastal plain species. Blooming occurs late June through late July; fruiting occurs early July through late August. The optimal identification period for this species is early July through late August.

Wild Hyacinth

Wild Hyacinth (*Camassia scilloides*), a State Endangered plant, is found in moist prairies remnants, especially along roads and railroad rights-of-way. Blooming occurs late April through late May; fruiting occurs starting in early June. The optimal identification period for this species is late April through late May.

Wild Licorice

Wild Licorice (*Glycyrrhiza lepidota*), a State Special Concern plant, is found in moist prairies and other grasslands and streambanks. It has been found naturalized on cinders of railroads and other disturbed areas. Blooming occurs throughout July; fruiting occurs early August through late October. The optimal identification period for this species is early August through late October.

Woodland Bluegrass

Woodland Bluegrass (*Poa sylvestris*), a State Special Concern plant, is found in very moist streambanks and mesic forest. Blooming occurs mid-May through June; fruiting occurs June through August. The optimal identification period for this species is early June through late July.

Woolly Milkweed

Woolly Milkweed (*Asclepias lanuginosa*), a State Threatened plant, is found in dry, sandy or gravelly hillside prairies. Blooming occurs late May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late June.

Yellow Gentian

Yellow Gentian (*Gentiana alba*), a State Threatened plant, is found in thin soil in dry, open woodlands, ridges and bluffs (often with dolomite near the surface), as well as moist sand prairies and roadside ditch. Blooming occurs late August through early October; fruiting occurs early September through early October. The optimal identification period for this species is throughout September.

Yellow Giant Hyssop

Yellow Giant Hyssop (*Agastache nepetoides*), a State Threatened plant, is found in woodlands and forest edges, thickets, and river margins. Blooming occurs early June through early October; fruiting occurs late July through early October. The optimal identification period for this species is late July through late September.

Yellow Wild-indigo

Yellow Wild-indigo (*Baptisia tinctoria*), a State Special Concern plant, is found in oak barrens. Blooming occurs late June through late July; fruiting occurs throughout August. The optimal identification period for this species is late June through early August.

Appendix E

Species of Greatest Conservation Need of Driftless Area Study Streams

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on Driftless Area Study Streams in the Southwest Savanna and Western Coulees & Ridges Ecological Landscapes. Only SGCN with a high or moderate probability of occurring in these Ecological Landscapes are shown. Communities shown here are limited to those identified as “Major” or “Important” management opportunities in the Wisconsin Wildlife Action Plan (WDNR M006b). Letters indicate the degree to which each species is associated with a particular habitat type (S=significant association, M=moderate association, and L=low association). Animal-community combinations shown here that are assigned as either “S” or “M” are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan (see dnr.wi.gov/org/land/er/WWAP/ for more information about these data). Highlighted species have been documented on Driftless Area Study Streams properties.

	Major	Important						Present				
	Dry Prairie	Dry Cliff	Hemlock Relict	Pine Relict	Southern Dry Forest	Southern Dry-mesic Forest	Southern Mesic Forest	Cedar Glade	Emergent Marsh	Floodplain Forest	Shrub Carr	Southern Sedge Meadow
Species that are Significantly Associated with the Southwest Savanna Landscape												
Bell's Vireo	M										M	
Blanchard's Cricket Frog									S			S
Blanding's Turtle	S					M	M	M	S	M	M	M
Bobolink												M
Brown Thrasher	M											
Dickcissel	L											
Eastern Meadowlark	M											M
Field Sparrow	S							S				
Grasshopper Sparrow	S							L				
Henslow's Sparrow												L
Northern Bobwhite	M											
Ornate Box Turtle	S				S	S	M	S				
Pickereel Frog							M		S	M	M	S
Prairie Ringneck Snake	S				M	M		S				
Red-headed Woodpecker					M	M				M		
Short-eared Owl	M								L		M	M
Slender Madtom												
Upland Sandpiper	S											L
Vesper Sparrow	S											
Western Meadowlark	M											

	Major	Important						Present				
	Dry Prairie	Dry Cliff	Hemlock Relict	Pine Relict	Southern Dry Forest	Southern Dry-mesic Forest	Southern Mesic Forest	Cedar Glade	Emergent Marsh	Floodplain Forest	Shrub Carr	Southern Sedge Meadow
Willow Flycatcher	L									L	S	M
Yellow-bellied Racer	S	M			M	M		S				
Species that are Moderately Associated with the Southwest Savanna Landscape												
American Golden Plover									M			L
Black-billed Cuckoo										M	S	
Blue-winged Teal	L								S	M		M
Blue-winged Warbler					M	M	M			M	M	
Buff-breasted Sandpiper									M			
Bullsnake	S	S		M	M	M	M	S				
Eastern Red Bat			M	M	M	M	M	L	M	M	M	M
Franklin's Ground Squirrel	L											
Gravel Chub												
Loggerhead Shrike	M											
Northern Harrier	M								L		L	M
Northern Long-eared Bat			M	L	M	M	M	L	M	M	M	M
Ozark Minnow												
Prairie Vole	S											
Rusty Blackbird									M	S	M	
Solitary Sandpiper									S	S	L	L
Timber Rattlesnake	S	S		S	S	S	S	S		M		
Wood Thrush					M	S	S			M		
Woodland Vole					S	S	L			L		
Yellow-billed Cuckoo					L	M	M			S	M	

	Major													Important		
	Cedar Glade	Dry Cliff	Dry Prairie	Emergent Marsh	Floodplain Forest	Hemlock Relict	Moist Cliff	Oak Barrens	Pine Relict	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Mesic Forest	Northern Dry-mesic Forest	Pine Barrens	Southern Sedge Meadow
Species that are Significantly Associated with the Western Coulees and Ridges Landscape																
Acadian Flycatcher					M						L	S	S			
American Woodcock					L			L		S	L			L	L	
Bald Eagle					L											
Bell's Vireo			M							M						
Black Buffalo																
Black Rat Snake	S	S	S		M				S		S	S	S			
Black-billed Cuckoo					M			M		S				L	M	
Blanchard's Cricket Frog				S												S
Blanding's Turtle	M		S	S	M			S		M		M	M		S	M
Blue Sucker																
Blue-winged Teal			L	S	M											M
Blue-winged Warbler					M			L		M	M	M	M			
Bluntnose Darter																
Bobolink																M
Brown Thrasher			M					S							S	
Bullsnake	S	S	S					S	M		M	M	M		S	
Canvasback				L												
Cerulean Warbler					S						L	S	M			
Crystal Darter																
Dickcissel			L					L								
Eastern Massasauga Rattlesnake			S	S	S			S		S					S	S
Eastern Meadowlark			M													M
Field Sparrow	S		S					M							M	
Four-toed Salamander				S	S		L			S			S			M
Goldeye																
Grasshopper Sparrow	L		S					M							L	
Great Egret				S	M											
Henslow's Sparrow																L
Hooded Warbler												S	S			
Kentucky Warbler					S							M	S			
Lake Sturgeon																
Lark Sparrow	S		M					S							M	
Least Flycatcher					M					L	L	L	L	M		
Lesser Scaup				L												
Louisiana Waterthrush												S	S			
Midland Smooth Softshell Turtle																

	Major														Important	
	Cedar Glade	Dry Cliff	Dry Prairie	Emergent Marsh	Floodplain Forest	Hemlock Relict	Moist Cliff	Oak Barrens	Pine Relict	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Mesic Forest	Northern Dry-mesic Forest	Pine Barrens	Southern Sedge Meadow
Species that are Significantly Associated with the Western Coulees and Ridges Landscape																
Northern Bobwhite			M													
Northern Harrier			M	L				M		L					M	M
Northern Long-eared Bat	L			M	M	M		M	L	M	M	M	M	M		M
Northern Prairie Skink	S	M	S					S			M	M		M	S	
Ornate Box Turtle	S		S								S	S	M			
Ozark Minnow																
Paddlefish																
Pallid Shiner																
Peregrine Falcon		S														
Pickerel Frog				S	M					M			M			S
Prairie Racerunner	S		S					S								
Prairie Ringneck Snake	S		S					M			M	M				
Prothonotary Warbler					S											
Red-headed Woodpecker					M			M			M	M		L	L	
Red-shouldered Hawk					S							M	M	M		
Redside Dace																
River Redhorse																
Rusty Blackbird				M	S					M						
Shoal Chub (Speckled Chub)																
Short-billed Dowitcher				S												
Starhead Topminnow																
Timber Rattlesnake	S	S	S		M				S		S	S	S			
Veery					M	M			M	S		M	M	M		
Vesper Sparrow			S					S							S	
Western Meadowlark			M					M							L	
Western Sand Darter																
Western Slender Glass Lizard			S					S							S	
Western Worm Snake	S		S								M	M				
Whip-poor-will					L	L		M	M		S	S	L	M	M	
Willow Flycatcher			L		L					S						M
Wood Thrush					M						M	S	S	L		
Wood Turtle			S		S			S		S			M		S	M
Worm-eating Warbler											M	S	M			
Yellow-bellied Racer	S	M	S					M			M	M			M	
Yellow-billed Cuckoo					S					M	L	M	M			
Yellow-crowned Night-Heron				M	S					M						

	Major													Important		
	Cedar Glade	Dry Cliff	Dry Prairie	Emergent Marsh	Floodplain Forest	Hemlock Relict	Moist Cliff	Oak Barrens	Pine Relict	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Mesic Forest	Northern Dry-mesic Forest	Pine Barrens	Southern Sedge Meadow
Species that are Moderately Associated with the Western Coulees and Ridges Landscape																
American Golden Plover				M												L
Black Tern				S												L
Buff-breasted Sandpiper				M												
Eastern Red Bat	L			M	M	M		M	M	M	M	M	M	M	L	M
Franklin's Ground Squirrel			L					S							S	
Gilt Darter																
Hoary Bat	L			M	M	M			M	M	L	L	L	M		M
King Rail				S												M
Osprey																
Prairie Vole			S					M							L	
Short-eared Owl			M	L					M							M
Silver-haired Bat	L			M	M	M			M	L	L	L	L	M		M
Solitary Sandpiper				S	S					L						L
Upland Sandpiper			S					M							M	L
Whooping Crane				S												M
Woodland Vole					L			L			S	S	L			
Yellow-throated Warbler					S							M				

Appendix F

Wisconsin Natural Heritage Working List Explanation

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. Most of the species and natural communities on the list are actively tracked and we encourage data submissions on these species. This list is meant to be dynamic - it is updated as often as new information regarding the biological status of species becomes available. See the Endangered Resources Program web site for the most recent Natural Heritage Inventory Working List (<http://dnr.wi.gov/org/land/er/wlist/>).

Key

Scientific Name: Scientific name used by the Wisconsin Natural Heritage Inventory Program.

Common Name: Standard, contrived, or agreed upon common names.

Global Rank: Global element rank. See the rank definitions below.

State Rank: State element rank. See the rank definitions below.

US Status: Federal protection status in Wisconsin, designated by the Office of Endangered Species, U.S. Fish and Wildlife Service through the U.S. Endangered Species Act. LE = listed endangered; LT = listed threatened; XN = non-essential experimental population(s); LT,PD = listed threatened, proposed for de-listing; C = candidate for future listing.

WI Status: Protection category designated by the Wisconsin DNR. END = endangered; THR = threatened; SC = Special Concern.

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are SC/P = fully protected; SC/N = no laws regulating use, possession, or harvesting; SC/H = take regulated by establishment of open closed seasons; SC/FL = federally protected as endangered or threatened, but not so designated by WDNR; SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

Global & State Element Rank Definitions

Global Element Ranks:

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU = Possibly in peril range-wide, but their status is uncertain. More information is needed.

GX = Believed to be extinct throughout its range (e.g. Passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? = Not ranked.

Species with a questionable taxonomic assignment are given a "Q" after the global rank.

Subspecies and varieties are given subranks composed of the letter "T" plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

State Element Ranks

S1 = Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in Wisconsin because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in Wisconsin (21 to 100 occurrences).

S4 = Apparently secure in Wisconsin, with many occurrences.

S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly although not every year); a few of these species (typically long-distance migrants such as some birds and butterflies) may have even bred on one or more of the occasions when they were recorded.

SE = An exotic established in the state; may be native elsewhere in North America.

SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SN = Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in Wisconsin. This category includes migratory birds and bats that pass through twice a year or, may remain in the winter (or, in a few cases, the summer) along with certain lepidoptera which regularly migrate to Wisconsin where they reproduce, but then completely die out every year with no return migration. Species in this category are so widely and unreliably distributed during migration or in winter that no small set of sites could be set aside with the hope of significantly furthering their conservation.

SZ = Not of significant conservation concern in Wisconsin, invariably because there are no definable occurrences in the state, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long-distance migrants whose occurrence during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. Typically, the SZ rank applies to a non-breeding population.

SR = Reported from Wisconsin, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports that are hard to dismiss because the habitat is now destroyed.

SRF = Reported falsely (in error) from Wisconsin but this error is persisting in the literature.

SU = Possibly in peril in the state, but their status is uncertain. More information is needed.

SX = Apparently extirpated from the state.

State Ranking of Long-Distance Migrant Animals:

Ranking long distance aerial migrant animals presents special problems relating to the fact that their non-breeding status (rank) may be quite different from their breeding status, if any, in Wisconsin. In other words, the conservation needs of these taxa may vary between seasons. In order to present a less ambiguous picture of a migrant's status, it is necessary to specify whether the rank refers to the breeding (B) or non-breeding (N) status of the taxon in question. (e.g. S2B,S5N).

APPENDIX G

Primary Inventory Sites of Driftless Area Study Streams

Seventeen ecologically important sites, or ‘Primary Sites,’ were identified on Driftless Area Study Streams properties (see Figures 1 and 2 for overview maps). Primary Sites are delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

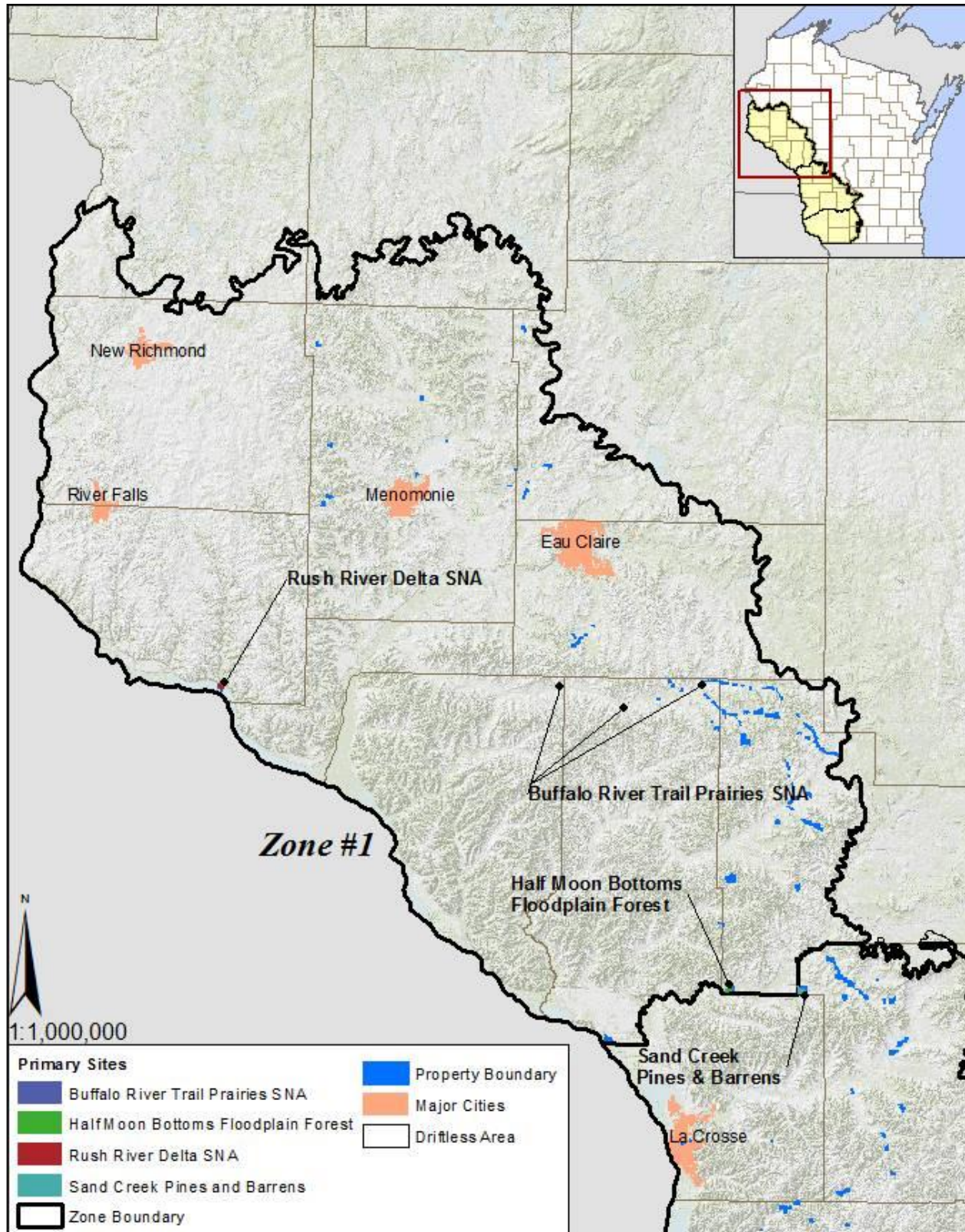
Primary Sites

page

DAS01. COPPER CREEK	Error! Bookmark not defined.
DAS02. HALF MOON BOTTOMS FLOODPLAIN FOREST	Error! Bookmark not defined.
DAS03. EUREKA MAPLE WOODS & PORTLAND MAPLES STATE NATURAL AREAS.....	Error! Bookmark not defined.
DAS04. BEAR CREEK WETLANDS	Error! Bookmark not defined.
DAS05. COON CREEK CLIFFS STATE NATURAL AREA.....	Error! Bookmark not defined.
DAS06. SAND CREEK PINES AND BARRENS.....	Error! Bookmark not defined.
DAS07. LA CROSSE RIVER PINE-OAK BARRENS	Error! Bookmark not defined.
DAS08. RUSH CREEK COULEES AND RIDGES	Error! Bookmark not defined.
DAS09. SNOW BOTTOM STATE NATURAL AREA	Error! Bookmark not defined.
DAS10. TROUT CREEK UPLANDS.....	Error! Bookmark not defined.
DAS11. PINNACLE ROCK REARING STATION	Error! Bookmark not defined.
DAS12. MILANCTHON CREEK.....	Error! Bookmark not defined.
DAS13. BIG SPRING CREEK.....	Error! Bookmark not defined.
DAS14. TAITER CREEK	Error! Bookmark not defined.
DAS15. RUSH RIVER DELTA STATE NATURAL AREA.....	Error! Bookmark not defined.
DAS16. HULBURT CREEK WOODS STATE NATURAL AREA.....	Error! Bookmark not defined.
DAS17. BUFFALO RIVER TRAIL PRAIRIES STATE NATURAL AREA.....	Error! Bookmark not defined.

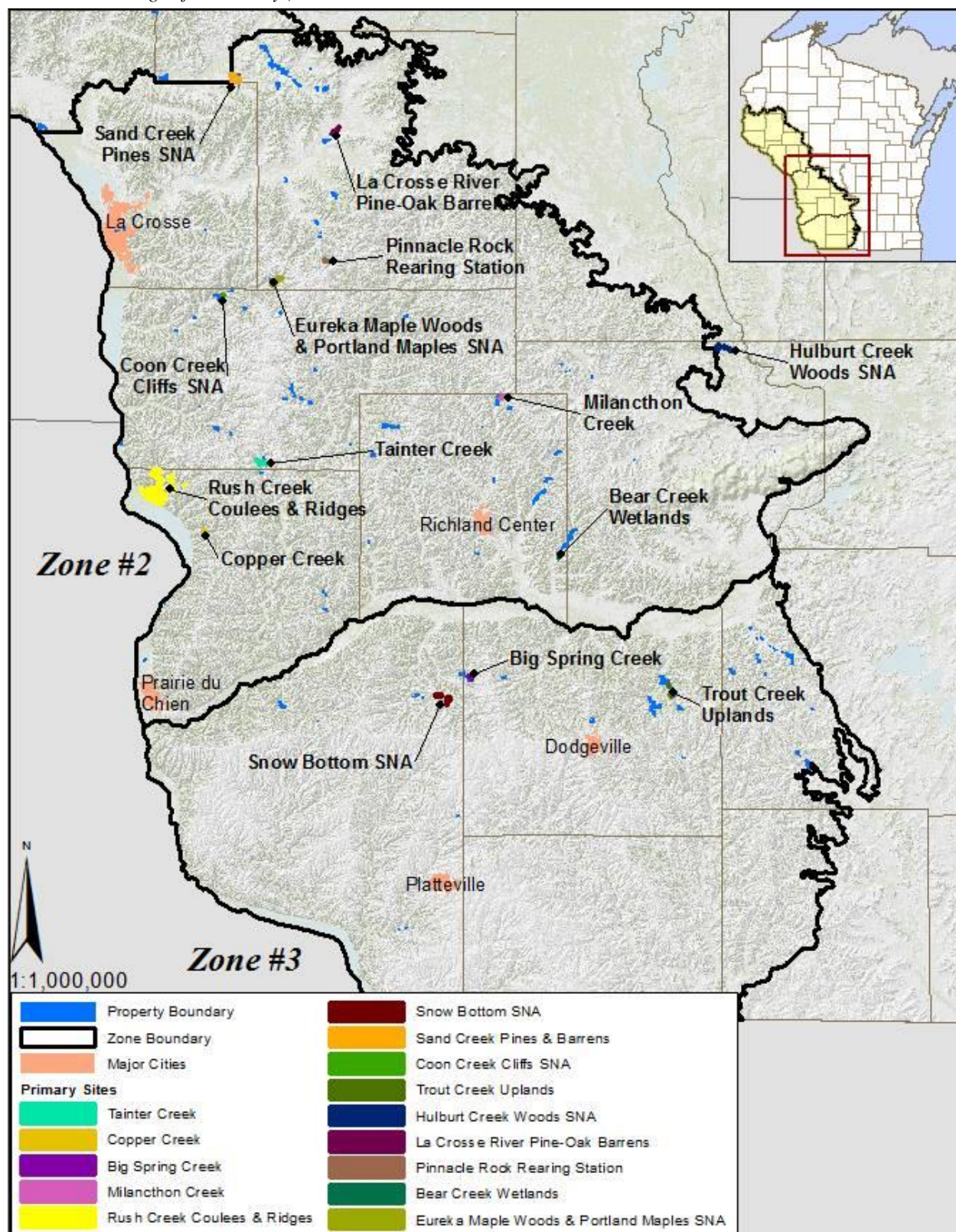
Primary Sites of Driftless Area Study Streams (Zone 1)

(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)



Primary Sites of Driftless Area Study Streams (Zones 2 and 3)

(The Driftless Area is divided into arbitrary zones for convenient frames of reference for report. Property boundaries enlarged for visibility.)



DAS01. COPPER CREEK

Location

Properties:	LaCrosse Area Comprehensive Fishery Area
County:	Crawford
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16)
Approximate Size (acres):	50

Description of Site

This site lies on Copper Creek, and harbors Oak Woodland on a steep north-facing slope and a moderate-quality but small (five-acre) Southern Sedge Meadow. The Oak Woodland was logged approximately 20 years ago and contains stumps 24-30 inches diameter at breast height (dbh). The overstory is dominated by 14- to 18-inch dbh white oak (*Quercus alba*) and red oak (*Q. rubra*) that together create 80% canopy cover. The subcanopy is comprised of American elm (*Ulmus americana*), hop-hornbeam (*Ostrya virginiana*), shagbark hickory (*Carya ovata*), and black cherry (*Prunus serotina*). A moderate shrub layer consists of American hazelnut (*Corylus americana*), eastern prickly gooseberry (*Ribes cynosbati*), chokecherry (*Prunus virginiana*), and common blackberry (*Rubus allegheniensis*). The ground layer is moderately diverse with scattered savanna indicators (Pruka, 1995), including Culver's root (*Veronicastrum virginicum*), large yellow lady's-slipper (*Cypripedium parviflorum* var. *pubescens*), and golden Alexanders (*Zizia aurea*). The sedge meadow is dominated by tussock sedge (*Carex stricta*), shining aster (*Aster firmus*), spotted Joe-Pye-weed (*Eupatorium maculatum*), boneset (*E. perfoliatum*), and broad-leaved cat-tail (*Typha latifolia*).

Significance of Site

Copper Creek is a Class I trout stream. Two rare plant species are found here, one from the Southern Sedge Meadow and one from the Oak Woodland. The sedge meadow is unusual in that it lacks the virtually ubiquitous non-native invasive reed canary grass (*Phalaris arundinacea*).

This site harbors a significant opportunity for Oak Woodland conservation, a rare community type. Additionally, Oak Woodland that occurs on north-facing slopes is exceptionally rare, as most sites occur on south- and west-facing slopes.

Copper Creek falls within the "Rush Creek" Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the larger "Driftless Area Features" Significant Ecological Feature, which promotes conservation of a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub Carr, Dry Cliffs, and Moist Cliffs over loess and sandstone influenced soils.

Management Considerations

Restoration and management of the Oak Woodland is a high priority at this site. There currently exists an opportunity to co-manage Oak Woodland with an adjacent private landowner, who shares similar management goals for their land.

Monitoring and control of non-native invasive plants should be a priority action. Japanese hops (*Humulus japonicus*; NR-40 Restricted in Grant and Crawford Counties) occurs along the creek, currently in low densities on state land. It is found in higher densities on private land upstream. This

annual vine is of particular concern due to its ability to displace other species during the growing season and tendency to increase the potential for streambank erosion and sedimentation as it leaves no vegetative cover during winter and early spring. Covered with stiff prickles that can tear clothing, it also forms dense, entangled thickets that have the potential to significantly impede fishing access. Purple loosestrife (*Lythrum salicaria*) is found in the wetland. A handful of garlic mustard (*Alliaria petiolata*) seedlings were pulled from the Oak Woodland by the community surveyor in 2010.

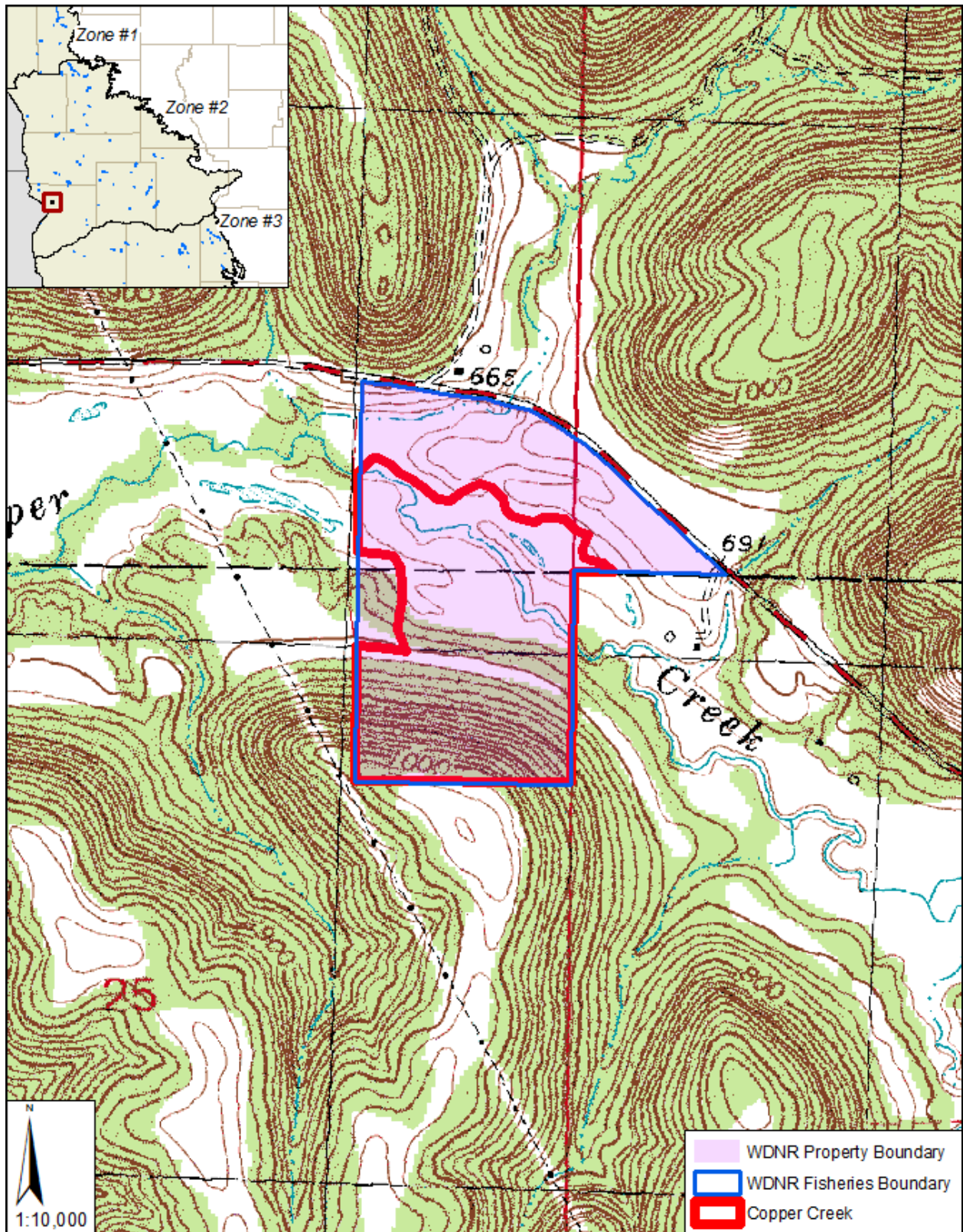
Copper Creek is rated an Exceptional Resource Water (ERW), indicating that it warrants additional protection from the effects of pollution. This designation is intended to meet federal Clean Water Act obligations.

Past hydrologic alteration has occurred on Copper Creek. The Creek has a deeply eroded (10-foot-deep) channel, indicating flashy, high-volume floods during rain events, probably due to loss of riparian wetlands and vegetative cover upstream. Restoration of stream hydrology and morphology might be considered when developing strategies for ecosystem management, although careful monitoring for incipient reed canary grass invasions (and other non-native invasive species) would be necessary for several years after soil disturbance occurs.



**Japanese hops at Copper Creek.
Photo by Ryan O'Connor.**

DAS01. Copper Creek Primary Site



DAS02. HALF MOON BOTTOMS FLOODPLAIN FOREST

Location

Properties:	Half Moon Bottoms State Natural Area, Half Moon Lake Fishery Area
County:	Jackson
Landtype Association:	Boone Valleys and Hills (222Lb05)
Approximate Size (acres):	306

Description of Site

Located along a nearly one-mile stretch of the Black River, Half Moon Bottoms State Natural Area (SNA) features a good-quality Floodplain Forest dominated by silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), river birch (*Betula nigra*), and swamp white oak (*Quercus bicolor*). Other trees include red oak, white oak, yellowbud hickory (*Carya cordiformis*), and aspen (*Populus* sp.). Monkey flower (*Mimulus ringens*), wood nettle (*Laportea canadensis*), and cut-leaved coneflower (*Ratibida laciniata*) are common in the ground layer. Oxbow lakes are prominent features here, as are pine-clad sandstone cliffs. Half Moon Bottoms SNA was designated a State Natural Area in 2008.

The Floodplain Forest continues on the Fishery Area east of the SNA, with similar composition but younger trees and slightly less canopy cover. A fair-quality, 11-acre floodplain terrace savanna lies in the midst of the Floodplain Forest within the Fishery Area. Open-grown oaks (bur [*Quercus macrocarpa*], Hill's [*Q. ellipsoidalis*] & swamp white) are scattered throughout a low-diversity ground layer dominated by Kentucky bluegrass (*Poa pratensis*). Other species that are common here include white wild indigo (*Baptisia alba*), big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*). Occasional wet pockets harbor prairie cord grass (*Spartina pectinata*) and fox sedge (*Carex vulpinoidea*).

Significance of Site

This expanse of Floodplain Forest supports area-sensitive forest interior breeding birds, including a rare hawk. Four SGCN birds also breed here. The site falls within the Van Loon Bottoms Important Bird Area (WDNR 2007). Half Moon Bottoms Floodplain Forest is also important to a number of herptile species. The backwater channels and oxbow lakes have abundant downed trees and marsh habitat that could provide potential basking sites and foraging areas for a rare turtle, found near the site. Although the site provides little if any suitable nesting habitat (Hay 2011) for wood turtles (*Glyptemys insculpta*), false map turtles (*Graptemys pseudogeographica*), or smooth softshell (*Apalone mutica*) turtles, it is likely that they use the riparian habitat along the Black River for foraging in spring, summer, and early fall, and for basking. A Special Concern frog is common on this site. Half Moon Bottoms is also important to bats: three species were encountered during acoustic surveys, including two State Threatened species and one Special Concern species.

Half Moon Lake Fishery Area is an "Area of Special Natural Resource Interest" (ASNRI) that includes warmwater fish species. Wisconsin Statute 281.37 defines an ASNRI as "an area that possesses significant ecological, cultural, aesthetic, educational, recreational or scientific values."

Management Considerations

Maintaining and enhancing the Floodplain Forest, as well as habitat for forest interior birds, are high priorities for this primary site. This would mostly involve allowing the forest to mature, and controlling non-native invasive species, particularly reed canary grass and moneywort (*Lysimachia nummularia*).

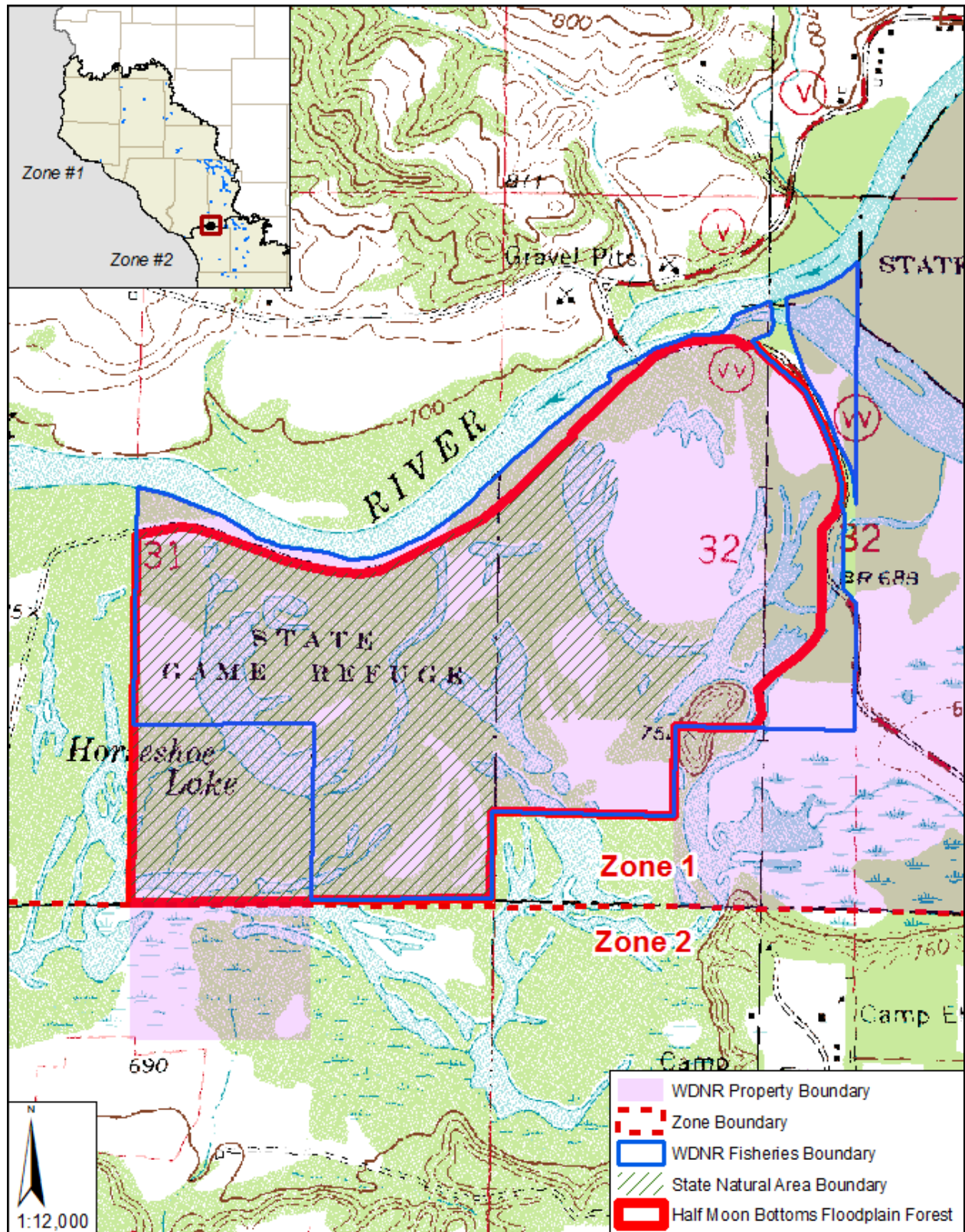
Prescribed burning of the floodplain savanna would enhance conditions for growth of native species and set back non-native invasives and encroaching brush. This could easily be done in early spring, when this microsite is literally an island surrounded by water and wet Floodplain Forest.

The WDNR may not consider a mitigation project in reviewing an application for an activity that adversely affects the ASNRI or wetlands within it. (Note: Section 281.37 is repealed effective July 1, 2012 by 2011 Wis. Act 118.)



**Floodplain terrace savanna with abundant white wild indigo at Half Moon Bottoms Floodplain Forest.
Photo by Amy Staffen**

DAS02. Half Moon Bottoms Floodplain Forest Primary Site



DAS03. EUREKA MAPLE WOODS & PORTLAND MAPLES SNAs

Location

Properties:	Eureka Maple Woods State Natural Area, Portland Maples State Natural Area, Coon Creek Fishery Area (Timber Coulee Creek and Rullands Coulee Creek units)
County:	Monroe
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16)
Approximate Size (acres):	214

Description of Site

Eureka Maple Woods State Natural Area (SNA) lies above Timber Coulee Creek, a tributary of Coon Creek. High-quality Southern Mesic Forest occurs here on steep north-facing slopes and deep ravines. The forest is dominated by 18- to 24-inch dbh sugar maple (*Acer saccharum*), with lesser amounts of basswood (*Tilia americana*). The ridgetop forest is second growth, slightly drier, and dominated by maples (*Acer* spp.), white ash (*Fraxinus americana*), red oak, and yellowbud hickory. The understory includes maple (*Acer* sp.), American elm, and hop-hornbeam. The ground layer is exceptionally diverse, especially on pristine north-facing slopes, where lush carpets of spring flora and ephemerals abound (e.g., Dutchman's breeches (*Dicentra cucullaria*), squirrel-corn (*D. canadensis*), white trout-lily (*Erythronium albidum*), bishop's cap (*Mitella diphylla*), nodding wake-Robin (*Trillium flexipes*), large-flowered trillium (*T. grandiflorum*), and large-flowered bellwort (*Uvularia grandiflora*). A ten-acre tract that was previously logged is recovering, with most trees still sapling-sized. Eureka Maple Woods was designated a SNA in 1989.

Portland Maples SNA harbors high-quality Southern Mesic Forest on steep north-facing slopes above Rullands Coulee Creek. Thirty-inch dbh sugar maple and basswood are typical here, along with scattered red maple (*Acer rubrum*). Large eastern leatherwood (*Dirca palustris*) occupies the understory. The ground layer is diverse with species such as bulblet fern (*Cystopteris bulbifera*), maidenhair fern (*Adiantum pedatum*), false rue anemone (*Enemion biternatum*), and white bear sedge (*Carex albursina*). Portland Maples was designated a SNA in 2002.

Significance of Site

The Eureka Maple Woods and Portland Maples State Natural Areas primary site harbors high-quality ungrazed Southern Mesic Forest, a rare feature in Wisconsin. This site provides habitat for numerous rare species, including three State Threatened birds that require large blocks of closed-canopy forest. A rare terrestrial snail also inhabits the rich, moist mesic forest. Six rare plants are also known here.

Eureka Maple Woods and Portland Maples SNAs falls within the Coon Creek Mesic Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the larger Driftless Area Features Significant Ecological Feature, which promotes conservation of a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub Carr, Dry Cliffs, and Moist Cliffs over loess and sandstone influenced soils.

Timber Coulee Creek and Rullands Coulee Creek are class 1 trout streams.

Management Considerations

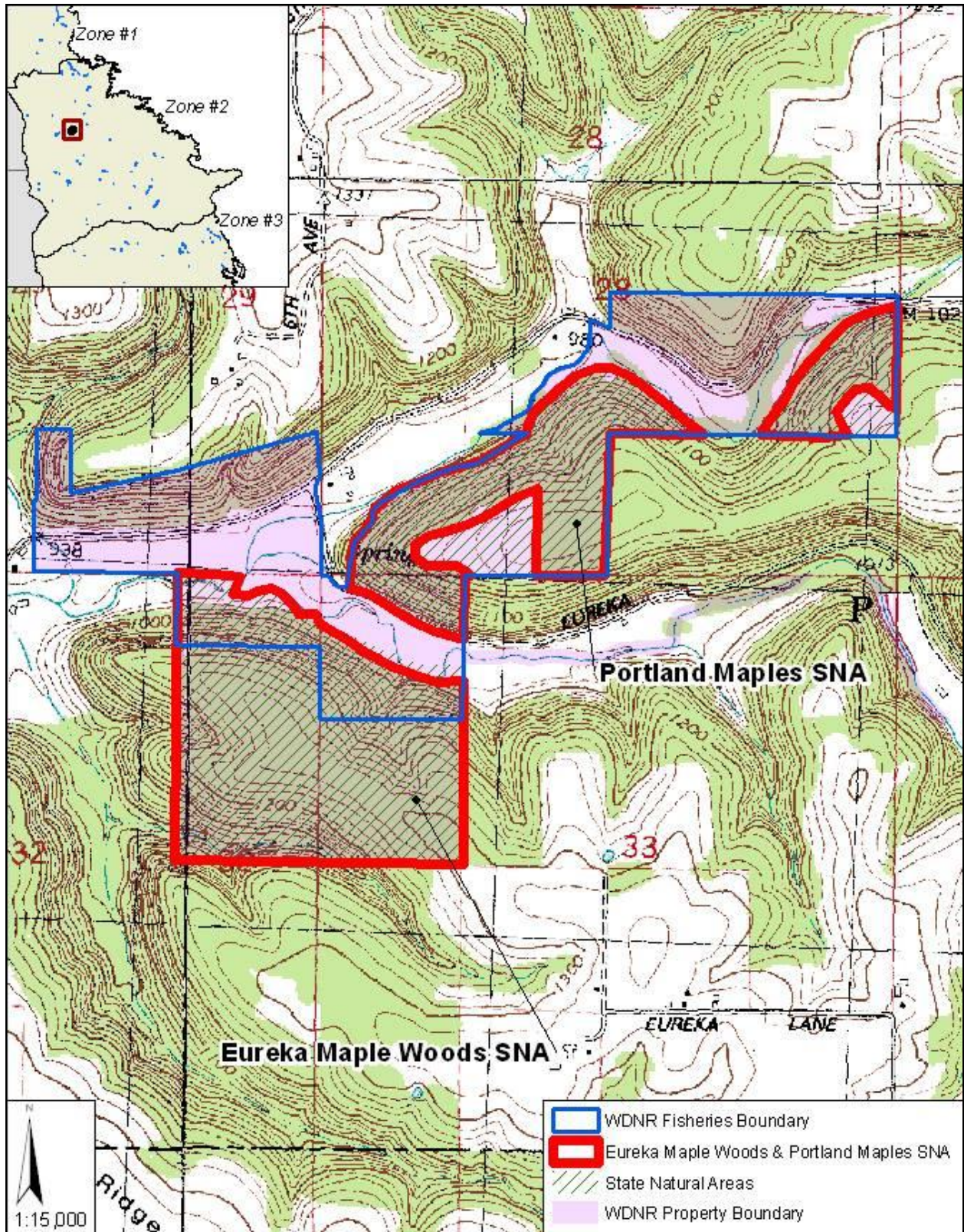
Promoting and maintaining ecological reference area conditions for old growth Southern Mesic Forest and maintaining habitat for forest interior birds are high priorities for this site. Rare terrestrial snails and plants will benefit from implementation of these management targets.

Diligent monitoring and control of non-native invasive plants are vital. Garlic mustard is beginning to invade along stream corridors below primary site, and invasive shrubs (e.g., common buckthorn [*Rhamnus cathartica*]) are prevalent on proximal south-facing slopes.



Steep north-facing slope above stream supporting high-quality Southern Mesic Forest at Eureka Maple Woods SNA. Photo by Ryan O'Connor

DAS03. Eureka Maple Woods & Portland Maples State Natural Areas Primary Site



DAS04. BEAR CREEK WETLANDS

Location

Properties:	Bear Creek Fishery Area, Bear Creek Sedge Meadow State Natural Area
County:	Richland, Sauk
Landtype Association:	Hills and Valleys - Wisconsin River Drainage (222Lc18)
Approximate Size (acres):	114

Description of Site

Bear Creek Wetlands contains two disjunct units of good-quality Southern Sedge Meadow that are recovering well from past grazing; Bear Creek flows through the center of both. Also present is Emergent Marsh along the creek. Sedges are dominant and forbs are present in higher than normal densities. Broad-leaved cat-tail and bulrushes (*Scirpus* spp.) are found in the wettest areas, while the highest ground supports Wet Prairie vegetation such as blue-joint grass (*Calamagrostis canadensis*), sweet Indian-plantain (*Hasteola suaveolens*), boneset, and bottle gentian (*Gentiana andrewsii*). Clean water flows through the meadows suggesting the possibility of groundwater seepage. Bear Creek Sedge Meadow was designated a State Natural Area in 2002.

Significance of Site

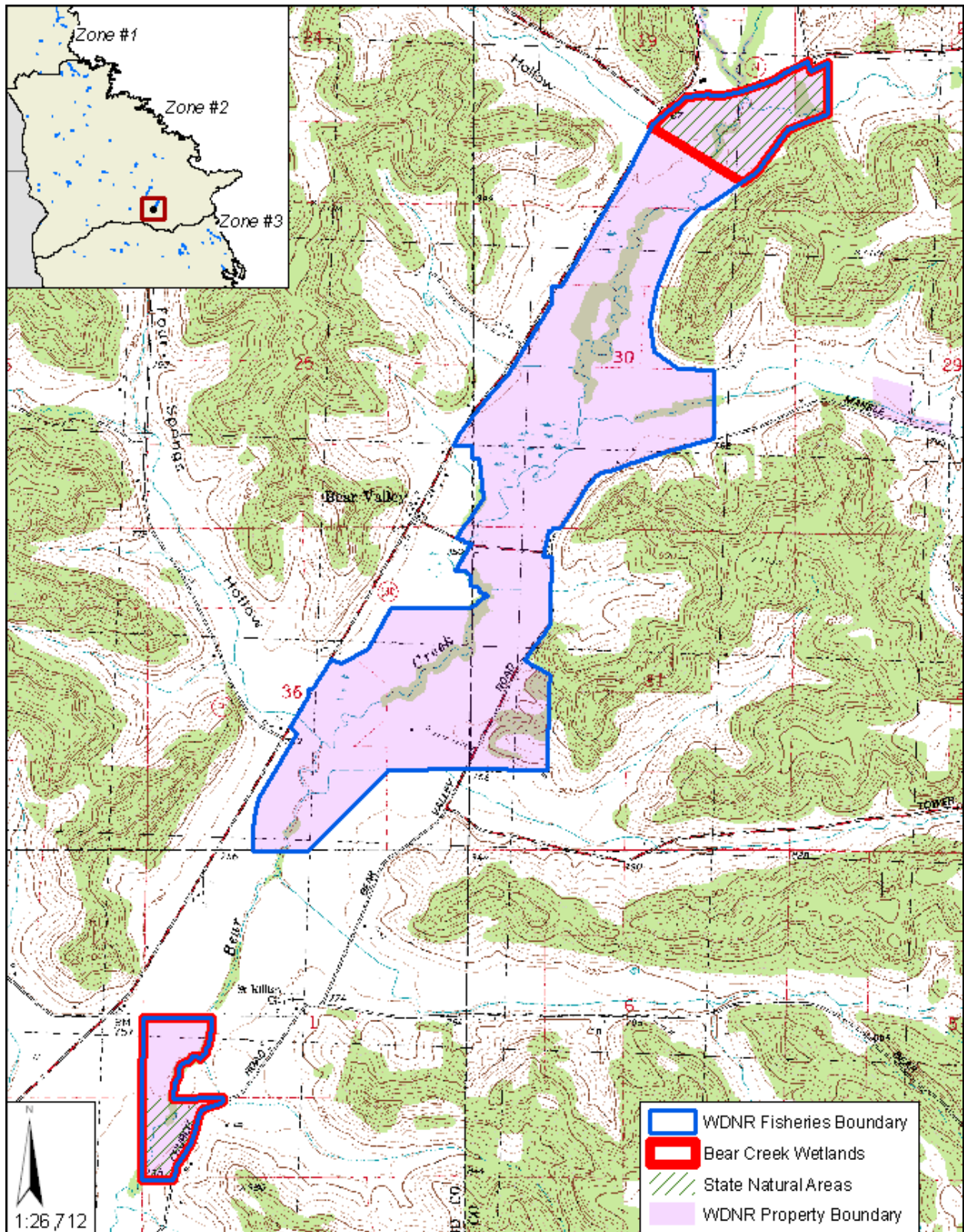
A Midwestern endemic plant of sedge meadows is found here. Birds that breed in this wetland include wood duck, sandhill crane, belted kingfisher, alder flycatcher, sedge and marsh wren, common yellowthroat, swamp sparrow, and at least one SGCN.

Management Considerations

Restoring and maintaining Southern Sedge Meadow characteristics will benefit rare and conservative plants and animals associated with this community type. Monitoring and control of non-native invasive species is a high-priority here, as reed canary grass and Canada thistle (*Cirsium arvense*) are making inroads from the surrounding areas. Application of prescribed fire and/or brushing will keep habitat open.

This wetland complex continues on fishery land continuing south from the north unit; it was excluded from the primary site due to its low quality (mostly reed canary grass). An opportunity for primary site expansion exists if this area is restored to sedge meadow, which would also increase the long-term viability of the good-quality wetlands in the current primary site boundaries, and enhance breeding habitat for declining grassland and marsh birds.

DAS04. Bear Creek Wetlands Primary Site



DAS05. COON CREEK CLIFFS STATE NATURAL AREA

Location

Properties:	Coon Creek Cliffs State Natural Area, Coon Creek Fishery Area
County:	Vernon
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16)
Approximate Size (acres):	27

Description of Site

Coon Creek Cliffs State Natural Area (SNA) features moist, dripping, mossy, sandstone cliffs that range in height from 5-20 feet. Seeps emanating from the cliffs form several small ravines. The cliff habitats support a diverse variety of mosses, liverworts, swamp saxifrage (*Saxifraga pensylvanica*), slender cliff brake (*Cryptogramma stelleri*), and several rare plants. The forest at the base of the cliffs has been grazed. Coon Creek Cliffs was designated a State Natural Area in 1986.

Significance of Site

This site supports four rare plants. Coon Creek Cliffs SNA represents one of the best terrestrial snail sites in the state (Theler, 2011). Ten snail species were identified during 2011 surveys, including four rare species. These animals rely on the moist cliff habitat and adjoining forest.

Coon Creek Cliffs State Natural Area falls within the Coon Creek Mesic Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the Driftless Area Features Significant Ecological Feature, which promotes a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub Carr, Dry Cliffs, and Moist Cliffs over loess and sandstone influenced soils.

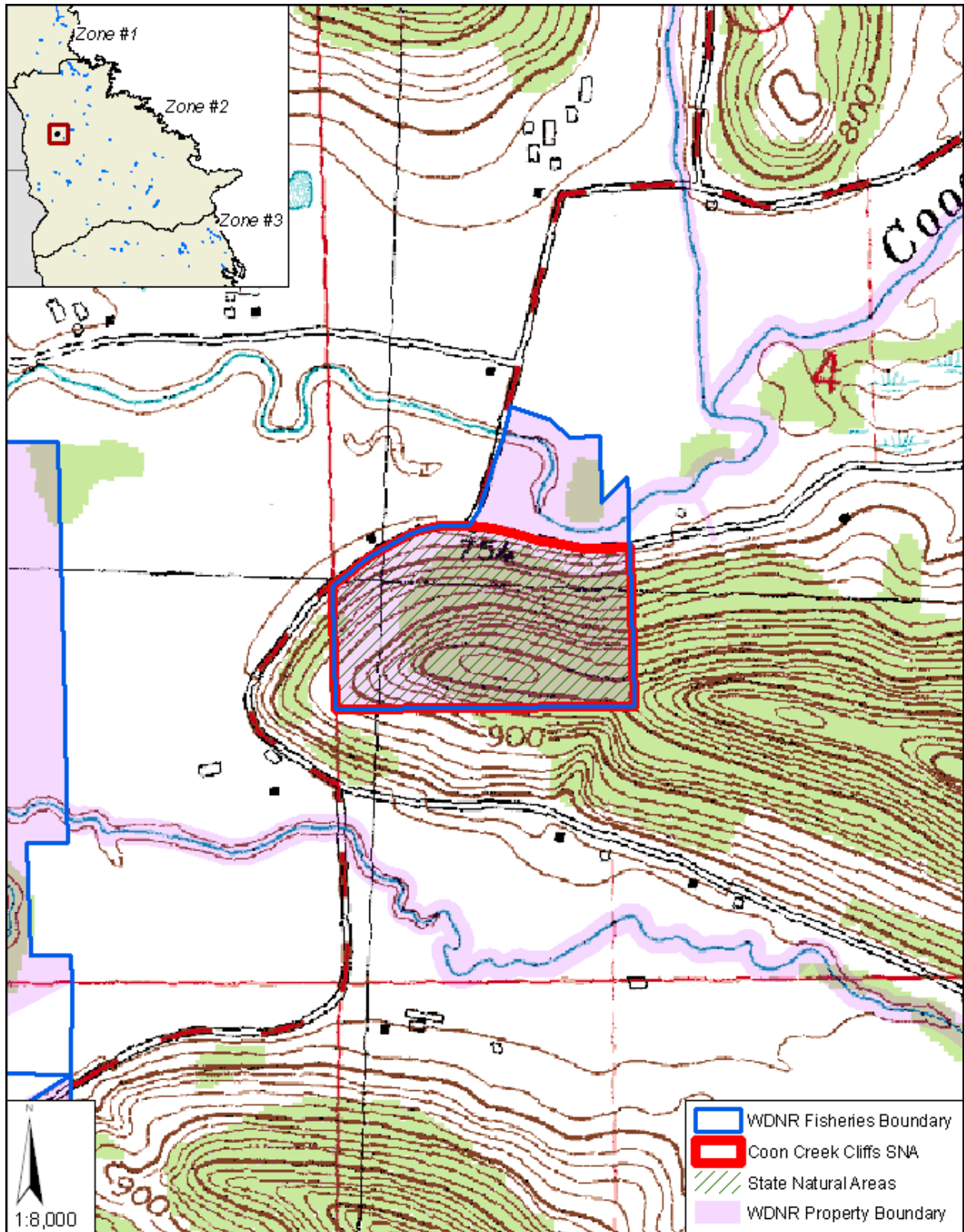
Management Considerations

Maintaining this site as a Moist Cliff ecological reference area is a priority, along with continued monitoring and protection of rare plants and snails. This can best be done by promoting a closed-canopy forest above and below the cliffs and through non-native invasive plant control. Garlic mustard seedlings were found in 2011 at the top of one of the ravine seeps, and in one small patch near the base of the slope near the road.



Coon Creek Cliffs SNA. Photo by Ryan O'Connor.

DAS05. Coon Creek Cliffs State Natural Area Primary Site



DAS06. SAND CREEK PINES AND BARRENS

Location

Properties:	Sand Creek Pines SNA, Sand Creek Streambank Protection Area
County:	Monroe, Jackson
Landtype Association:	Boone Valleys and Hills (222Lb05)
Approximate Size (acres):	483

Description of Site

Sand Creek Pines State Natural Area (SNA) lies mostly in the center of the larger primary site, occupying 150 acres along Sand and Cascade Creeks. The SNA features an undeveloped, mile-long corridor containing Sand Creek, a cold, fast, sandy-bottom, soft water stream that supports native brook trout. An Alder Thicket borders the stream with fen-like seepages along its banks, where angelica (*Angelica atropurpurea*), purple avens (*Geum rivale*), swamp aster (*Aster puniceus*), and skunk cabbage (*Symplocarpus foetidus*) grow. Beds of Canadian waterweed (*Elodea canadensis*) are common in the stream. White pine (*Pinus strobus*) is dominant on the north-facing slopes, with occasional groves of red pine (*P. resinosa*). Jack pine (*P. banksiana*), oaks (*Quercus* spp.), and red maple are also present. Scattered prairie species are found under canopy openings, including prairie drop-seed (*Sporobolus heterolepis*), Indian grass (*Sorghastrum nutans*), prairie larkspur (*Delphinium carolinianum*), and cream wild indigo (*Baptisia bracteata*). The level uplands away from the stream are a mix of overgrown jack pine-oak barrens and old field, with dense prickly-ash (*Zanthoxylum americanum*) and American hazelnut in the understory. Cascade Creek is a feeder stream that has a 10-foot-high waterfall. The forest is more mesic near the waterfall, with second-growth red maple, basswood, and yellowbud hickory, along with such herbs such as maidenhair fern, yellow blue-bead-lily (*Clintonia borealis*), and bishop's cap. Sand Creek Pines was designated a State Natural Area in 2002.

The rest of the primary site is within Sand Creek Fishery Area and occupies 333 acres on flat and sandy terrain south of the SNA.

Significance of Site

Cliff goldenrod (*Solidago sciaphila*) and a rare plant occur on the steep sandy slopes on the north side of Sand Creek. Declining grassland and shrubland birds utilize the barrens habitats on this site, including two SGCN. The sandy barrens also provide important habitat for herptiles, including two rare species. The Northern Dry-mesic Forest supports a diverse community of small mammals (none tracked by NHI), including masked shrew (*Sorex cinereus*), southern red-backed vole (*Clethrionomys gapperi*), white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), pygmy shrew (*Sorex hoyi*), and southern flying squirrel (*Glaucomys volans*). The site is also important for a number of bat species, including three that are rare.

Sand Creek has excellent water quality, a pure sand-bottom, and good submerged & emergent macrophytes along the stream margin and attached to submerged wood. Twenty-four aquatic invertebrate species were identified during surveys in 2011, including abundant coldwater scuds, Lepidostomatidae, Brachycentridae, and one SGCN mayfly. Sand Creek is a Class I trout stream.

Management Considerations

Sand Creek Pines and Barrens presents an opportunity to manage a mosaic of sandy habitat types that can benefit a large number of species, from Surrogate Grassland/Sand Prairie/barrens (Fishery Area) to Pine Barrens (outermost boundaries of SNA) to Northern Dry-mesic and Mesic Forest (SNA). To the extent practical, avoid abrupt transitions between communities. Soft community transitions may most easily be promoted through the usage of prescribed fire.

Natural succession in the absence of fire is currently significantly altering all habitats here. Remedial tree removal and brushing in barrens areas is recommended to restore habitat structure and to immediately improve habitat for grassland and barrens animals; this structure can be maintained thereafter with regular fire.

It is also recommended that the prairie plantings and degraded Pine Barrens to the north of the primary site (Fishery Area) be managed for barrens as well, to create a buffer for the higher quality habitat within the primary site and to expand habitat for grassland and barrens animals. This could involve removing windrows of pines and eliminating scattered Colorado blue spruces (*Picea pungens*).

Driving on the field lanes by visitors presents a threat to the herptiles on this property, as they are known to consistently bask in these open areas. Limitation of driving to only management-related activities is suggested; when practical, scouting ahead of the maintenance vehicle for herptiles would be optimal.

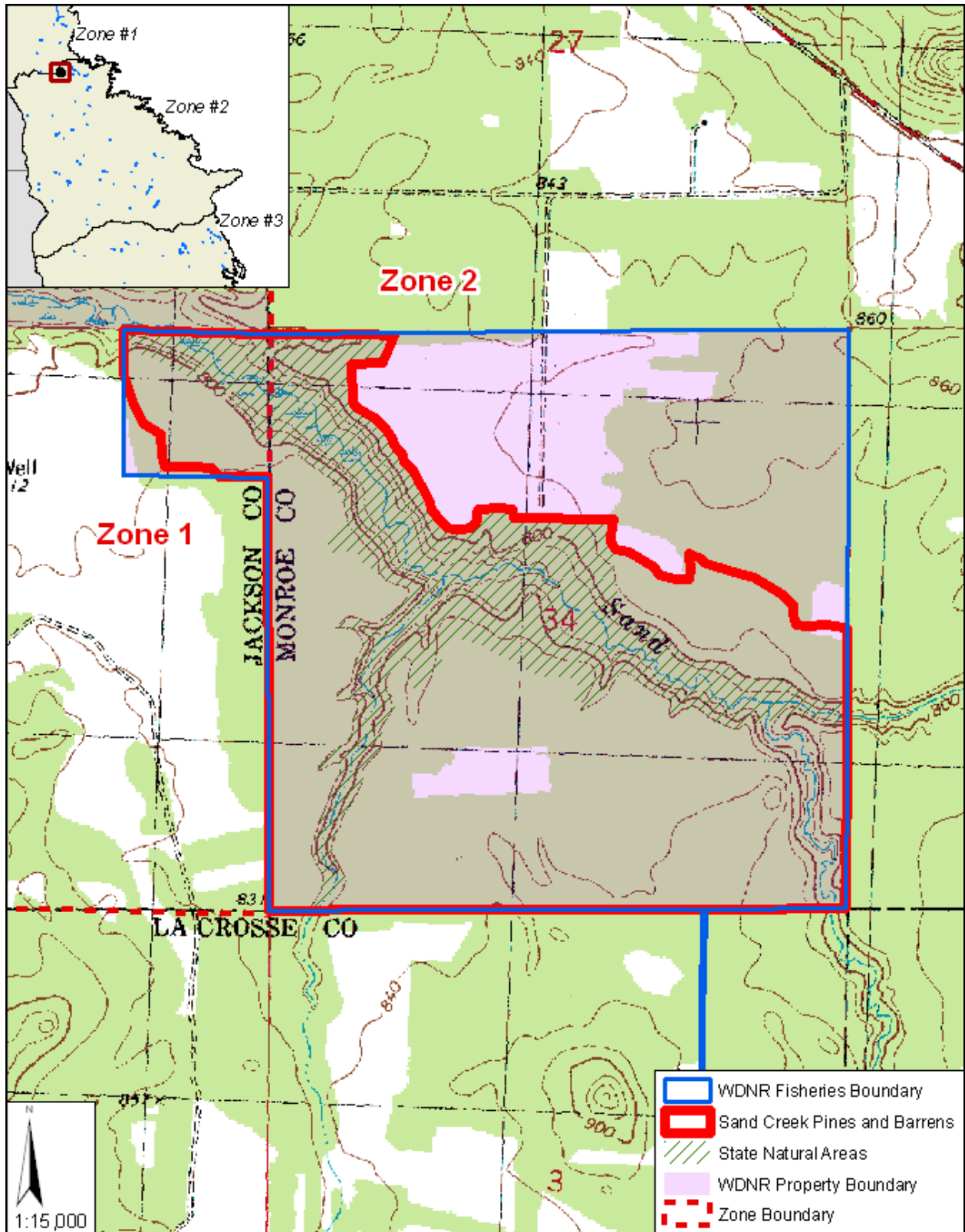
Some invasives species are just beginning to get established on this primary site, and thus should be given a high priority for control. In the barrens north of Sand Creek, there are early invasions of crown vetch (*Coronilla varia*), spotted knapweed (*Centaurea biebersteinii*), and yellow sweet-clover (*Melilotus officinalis*). In the brushy/wooded northeast corner of the Fishery Area, moderate amounts of mature non-native bush honeysuckle (*Lonicera* sp.) and common buckthorn are present; target removal of berry-producers first, then limit further reproduction with regular fire. In the SNA, scattered buckthorn and honeysuckle seedlings could easily be pulled or killed by fire. Reed canary grass is common along Sand Creek.

Sand Creek is rated an Exceptional Resource Water (ERW), indicating that it warrants additional protection from the effects of pollution. This designation is intended to meet federal Clean Water Act obligations.



Sand Creek Pine and Barrens. Photo by Amy Staffen.

DAS06. Sand Creek Pines and Barrens Primary Site



DAS07. LA CROSSE RIVER PINE-OAK BARRENS

Location

Properties:	La Crosse River Fishery Area
County:	Monroe
Landtype Association:	Boone Valleys and Hills (222Lb05)
Approximate Size (acres):	113

Description of Site

This primary site harbors a degraded barrens community and riparian wetland along the La Crosse River. The barrens lie on mostly flat terrain on a sandy terrace above the river. There is evidence of a major disturbance in the past 10-15 years: vegetative cover values in the barrens are extremely variable, ranging from open to brushy (with many downed trees) to 70-80% mature tree canopy. There are elements of both Pine Barrens and Oak Barrens here: Dominant trees are black oak (*Quercus velutina*), jack pine, red pine, and red maple, most of which are 6-12 inches dbh, though some black oaks approach 24 inches dbh. The shrub layer is relatively dense, and is dominated by American hazelnut, common blackberry, chokecherry, and tree saplings. The ground layer is dominated by Pennsylvania sedge (*Carex pensylvanica*), along with a diverse suite of sun-loving grasses and forbs in canopy openings, including big bluestem, black-eyed Susan (*Rudbeckia hirta*), round-headed bush-clover (*Lespedeza capitata*), and dotted horsemint (*Monarda punctata*). Moving down to the river, one may encounter 10- to 20-foot tall sandy banks, mostly vegetated. The wetland corridor along the river lies 10-20 feet lower in elevation than the adjacent sand terrace, and is bounded by a steep, mostly vegetated sandy bank. The wetland is comprised of Alder Thicket with a narrow band of reed canary grass in the river bends. Other wetland plants found here include lake sedge (*Carex lacustris*), spotted Joe-Pye-weed, orange jewelweed (*Impatiens capensis*), and arrow-leaved tear-thumb (*Polygonum sagittatum*).

Significance of Site

La Crosse River Pine-Oak Barrens falls within the Fort McCoy Barrens and Oak Savanna Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the larger Bur Oak Openings Significant Ecological Feature, which promotes conserving a continuum of Sand Prairie, Oak Barrens, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Shrub-Carr, and Dry Cliff. This site harbors degraded Oak Barrens with high restoration potential, a rare community type in Wisconsin.

Although no threatened or endangered bird species were observed here during recent surveys, several SGCN associated with brushy, early-successional habitats were noted. This site lies within the Fort McCoy – Robinson Creek Important Bird Area (WDNR 2007), designated for its importance to grassland and savanna birds. The site is important for a number of bat species, including four that are rare.

Numerous priority herptile species have the potential of occurring on this property, particularly if it undergoes prairie/savanna restoration: gophersnake, slender glass lizard, six-lined racerunner (*Aspidoscelis sexlineata*), eastern hognosed snake, and North American racer (*Coluber constrictor*).

Although no rare terrestrial invertebrate species were detected, the site has great potential for conservative invertebrates if measures are taken to restore the site to Oak Barrens and Sand Prairie. This potential is belied by the fact that surveyors in 2011 identified a number of invertebrate species here that

are characteristic of Oak Barrens: pine elfin (*Callophrys niphon*), Olympia marble (*Euchloe olympia*), and skippers (subfamily Hesperinae).

This site also supports a rare sedge, known primarily in Jackson and Monroe Counties on the margins of barrens and wetlands. This species was last observed here in 1968; brief surveys to relocate the species in 2011 were unsuccessful.

Management Considerations

This site presents an opportunity to restore savanna (Pine or Oak Barrens) and Sand Prairie, as well as important habitat for animal species associated with these community types, particularly herptiles, birds, and lepidopterans (butterflies and moths). Restoration would involve opening up the canopy significantly (but leaving the largest trees) and promoting growth of a diverse suite of native prairie and savanna plants. Interseeding of native ground flora may be necessary in more highly degraded areas. It is recommended that the Fishery area property adjacent to the primary site be managed for barrens habitat as well to buffer the higher quality primary site and expand suitable habitat for barrens plants and animals; expansion of the primary site boundary into the surroundings could occur if barrens restoration is completed here.

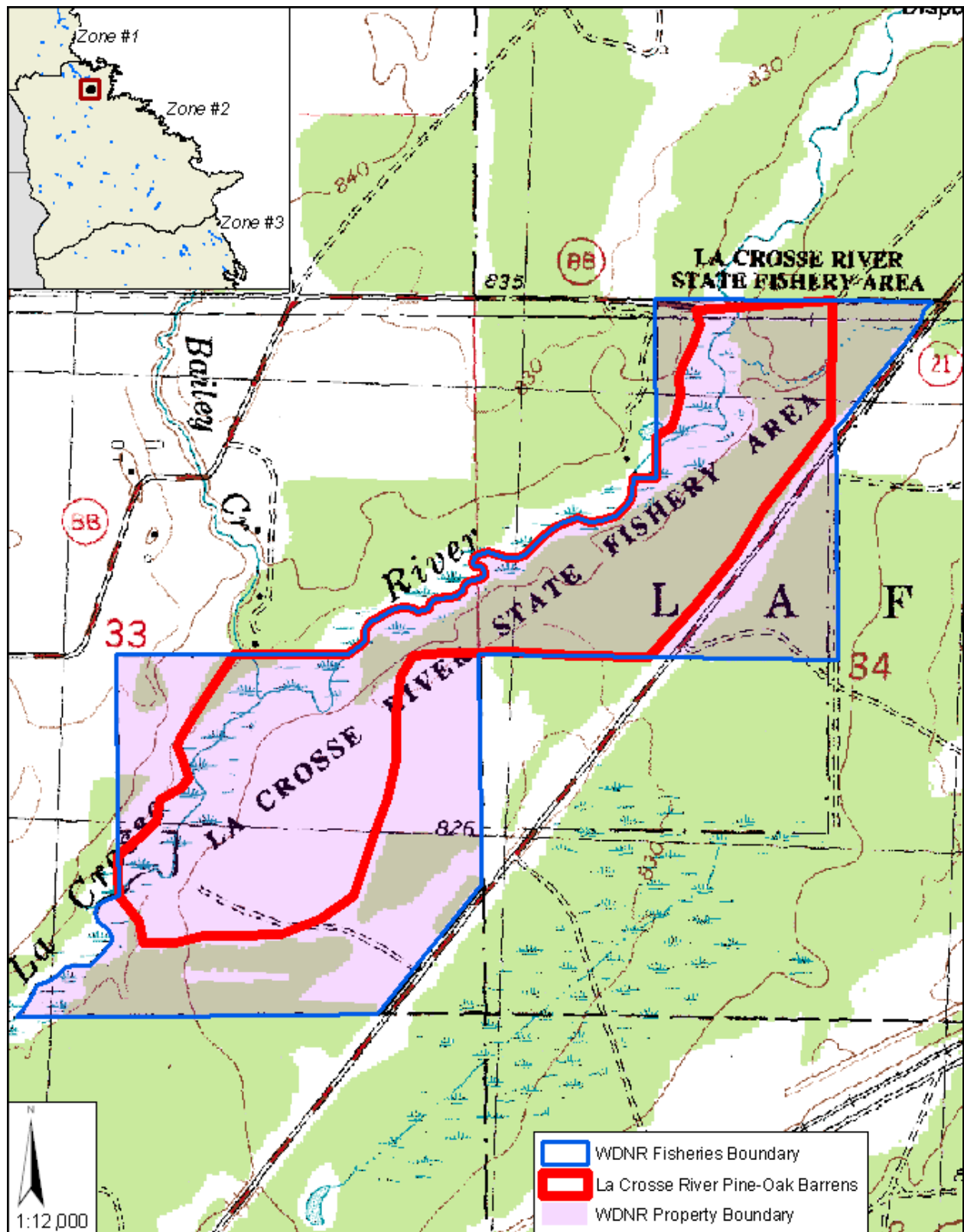
Restoring the riparian wetlands to native vegetation and enhancing sand terrace habitat would benefit wood turtles. Wood turtle nest sites could be enhanced by mechanically or chemically removing the crown vetch along the river banks and creating a long nesting mound (~18 inches high) above the slope and enlarging the area of open canopy on the upper terrace -- enough to allow sunlight to hit both the slope and nesting mound for at least eight hours per day.

Control of non-native invasive plants is a priority, especially before significant canopy opening and earth-moving occur. In open areas, especially along field roads, spotted knapweed and crown vetch are common. Throughout the site, Kentucky bluegrass and orange hawkweed (*Hieracium aurentiacum*) are common. Two large non-native bush honeysuckles are growing near the parking area, while glossy buckthorn (*Rhamnus frangula*) is occasional to locally common.



La Crosse River Fishery Area. Photo by Ryan O'Connor.

DAS07. La Crosse River Pine-Oak Barrens Primary Site



DAS08. RUSH CREEK COULEES and RIDGES

Location

Properties:	Rush Creek Streambank Protection Area, Rush Creek State Natural Area
County:	Crawford
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16), Viroqua Ridge (222Lc15), Mississippi River Valley Train-North (222Lc08)
Approximate Size (acres):	2,529

Description of Site

Rush Creek Coulees and Ridges consists of eight disjunct units in Crawford County. Most of the primary site is designated as a State Natural Area (SNA), but also includes four Fisheries-managed parcels that adjoin the SNA. Rush Creek flows through the largest unit, which also has frontage along the Mississippi River. Cooley Creek runs through or borders two other primary site units to the north. Numerous springs, seeps, and feeder streams originate within the primary site, flowing into Rush and



Dry Prairie at Rush Creek SNA. Photo by Thomas Meyer.

Cooley Creeks. The outstanding feature of Rush Creek Coulees and Ridges is a two-mile long series of dry lime prairies situated on the steep, southwest-facing, limestone-capped bluffs of the Mississippi River. Characteristic prairie plants include little bluestem, side-oats grama (*Bouteloua curtipendula*), blazing-stars (*Liatris* spp.), compass-plant (*Silphium laciniatum*), and bird's-foot violet (*Viola pedata*). The prairie areas transition into Oak Woodland and Southern Dry Forest on south- and west-facing slopes and into Dry-mesic Forest on north- and east-facing slopes. Areas of Oak Woodland and Southern Dry Forest are dominated by black, white & bur oaks, with shagbark hickory and black cherry among associates. Areas of Southern Dry-mesic Forest are dominated by red and white oak and a significant amount of black walnut (*Juglans nigra*), hickory (*Carya* sp.), basswood, sugar maple, and aspen. Common shrubs and mid-canopy species of the dry-mesic forest include gray and round-leaved dogwood (*Cornus racemosa*, *C. rugosa*), American hazelnut, and hop-hornbeam. The shady draws and coves support small stands of Southern Mesic Forest,

where sugar maple, basswood, and red oak dominate the canopy. Common upland forest herbs include (*Osmunda claytoniana*), wild geranium (*Geranium maculatum*), wild sarsaparilla (*Aralia nudicaulis*), and maidenhair fern. A good-quality Floodplain Forest of silver maples, American elm, eastern cottonwood (*Populus deltoides*), river birch, and willows (*Salix* spp.) lies along the banks of Rush Creek.

A small but high-quality Southern Sedge Meadow lies south of Mellem and Taylor Roads on a Fisheries-managed parcel. Fifty-five species were recorded here in one visit, including 12 sedge species, blue-joint grass, boneset, and fowl manna grass (*Glyceria striata*). Rush Creek SNA was designated in 1981.

Significance of Site

High-quality natural communities of Rush Creek Coulees and Ridges include Southern Dry Forest, Southern Dry-mesic Forest, Floodplain Forest, and Dry Prairie. The diversity and quality of the native communities here make it an important site for numerous plants and animals, many of which are rare. The prairie alone is tremendously important for a vast array of invertebrate species: During formal surveys in 2003, 106 invertebrate species were identified representing 36 different families. Of the six rare plant species known here, three are associated with savanna and woodland, one is associated with mesic forest, and one is associated with rich soils adjacent to the Coulee Creek floodplain. Rare animals known to reside on this site include three reptile species, four forest interior bird species, one grassland bird species, and two terrestrial snail species.

This primary site also falls within the Rush Creek-Forest Prairie Important Bird Area (IBA; WDNR 2007). This area has one of the most intact forested landscapes in the Driftless Area, thus supporting rare and declining forest interior birds. Thousands of migrating raptors concentrate in this IBA in both spring and fall, and numerous bald eagles are present in the winter.

One of the state's best populations of a rare Lepidopteran has been documented at Rush Creek SNA. In Wisconsin, this species has been reported from dry to dry-mesic hill prairies, sand prairies, and sand barrens and appears to have some level of area sensitivity as there have been few reports from small ≤ 10 acre sites. Four other Special Concern lepidopterans are also found here too. Additionally a rare planthopper occurs on the SNA. The cliffs at Rush Creek Coulees and Ridges provide important habitat for several rare terrestrial snail species. Two state endangered plant species and two state threatened plant species are found at this primary site.

Rush Creek Coulees and Ridges falls within the Rush Creek Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the larger Driftless Area Features Significant Ecological Feature, which promotes conservation of a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub Carr, Dry Cliffs, and Moist Cliffs over loess and sandstone influenced soils.

Rush and Cooley Creeks were sampled for aquatic invertebrates in 2011. Water quality was determined to be fair at both sample sites, and one SGCN mayfly was collected. Rush Creek is a Class III trout stream (within the primary site boundary). Cooley Creek is a Class I trout stream.

Management Considerations

Promoting and maintaining ecological reference area conditions for Dry Prairie, Floodplain Forest, and Southern Dry-mesic Forest, and maintaining habitat for forest interior birds are high priorities for this site. Restoring Oak Woodland, a rare oak savanna type, is also an important management opportunity and priority. Rare prairie invertebrates will benefit from Dry Prairie restoration and maintenance.

The ecological characteristics of the prairie and Oak Woodland areas may require an intensive prescribed fire management program, along with tree/shrub control using tree harvest and brushing. Managers may wish to retain fire-tolerant woody species such as oaks, hickories, and native shrubs such as hazelnut at

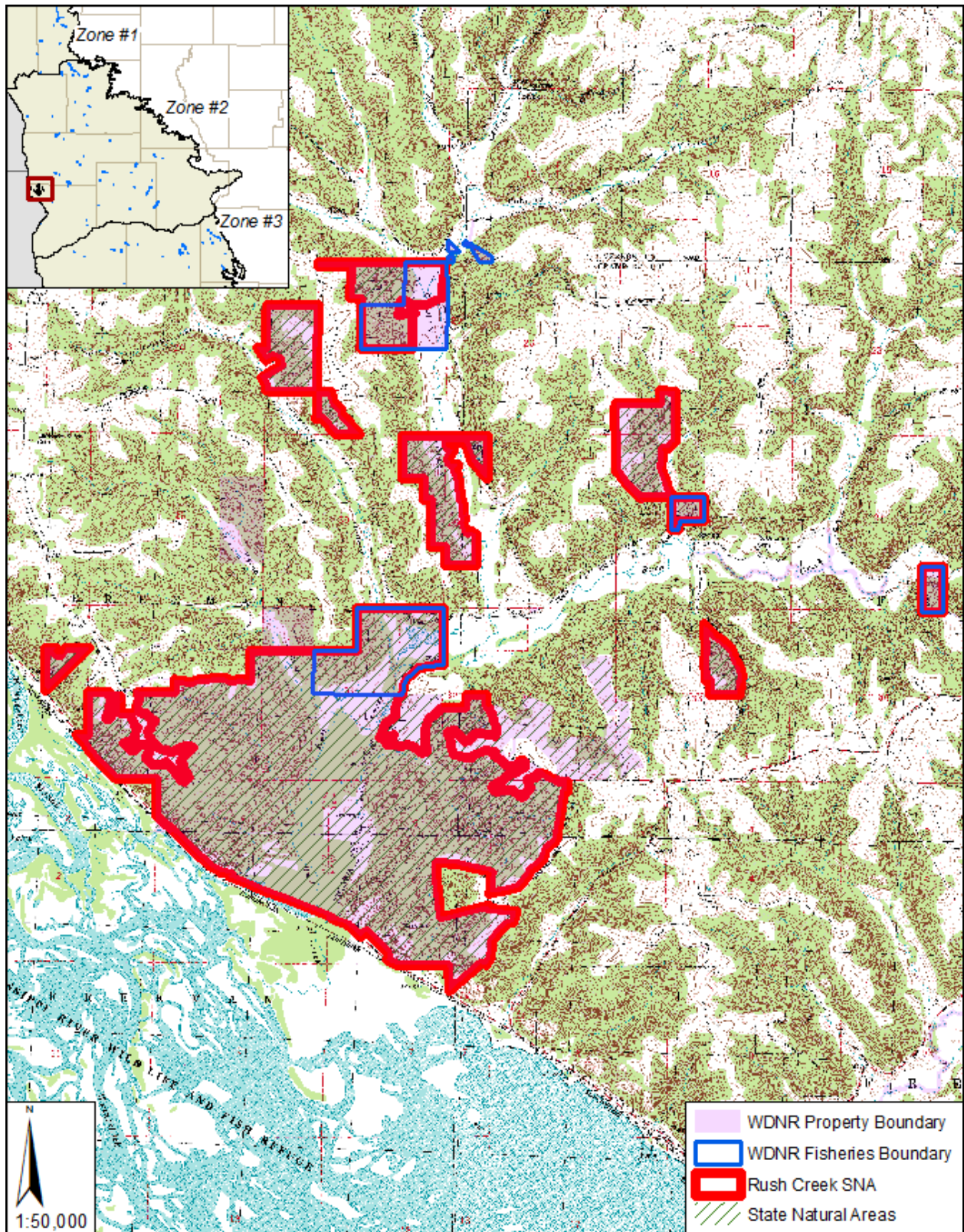
low densities. Augmentation of the oak savanna ground layer, if needed, may involve adding species that historically would have been found on the site, utilizing seeds or plugs from local genetic material.

Diligent monitoring and control of non-native invasive plants are vital. Purple loosestrife, common buckthorn, and non-native bush honeysuckle are known here.

Fisheries-managed wooded uplands within this primary site can be managed similarly to those in the SNA. The wetland that lies south of Mellem and Taylor Roads has very high restoration potential, as it has high native floral diversity, only 30% cover from shrubs, and only a small amount of reed canary grass. Brushing and prescribed fire can be applied to restore this small but high-quality wetland.

Cooley Creek is rated an Exceptional Resource Water (ERW), indicating that it warrants additional protection from the effects of pollution. This designation is intended to meet federal Clean Water Act obligations.

DAS08. Rush Creek State Natural Area Primary Site



DAS09. SNOW BOTTOM STATE NATURAL AREA

Location

Properties:	REM-Blue River, Snow Bottom State Natural Area
County:	Grant
Landtype Association:	Hills and Valleys - Wisconsin River Drainage (222Lc18)
Approximate Size (acres):	351

Description of Site

This primary site includes all of the State Natural Area (SNA) except for 80 acres on private lands. Snow Bottom SNA protects a diverse landscape encompassing some of the most significant remaining Pine Relicts in Wisconsin, as well as many other important and uncommon features including springs, Southern Dry-mesic Forest, Oak Woodland, riparian areas, and geological features. Pine Relicts are located on scattered sandstone cliffs up to 300 feet high; stands range in size from two to 15 acres in size. They are dominated by red and white pine (18-24 inches dbh), with white and black oak co-dominant in places. Regeneration varies from site to site: Some have abundant white pine in the sapling layer, while others, usually the smaller isolated relicts, are succeeding to oak. Subcanopy species of the Pine Relicts include paper birch (*Betula papyrifera*), red cedar (*Juniperus virginiana*), and northern mountain ash (*Sorbus decora*). Characteristic shrub and ground layer species include huckleberry (*Gaylussacia baccata*), bearberry (*Arctostaphylos uva-ursi*), northern bush-honeysuckle (*Diervilla lonicera*), bracken fern (*Pteridium aquilinum*), poverty oat grass (*Danthonia spicata*), and numerous dry mosses. Southern Dry Forest dominated by white oak occurs on thin-soiled flat 'benches' adjacent to the Pine Relicts and cliffs. This eventually transitions to Southern Dry-mesic Forest, where 20- to 24-inch dbh red and white oak are dominant, along with sugar maple, basswood, shagbark hickory, American elm, and red maple as associates. The ground layer of the dry-mesic forest is diverse, with Jack-in-the-pulpit (*Arisaema triphyllum*), large-flowered bellwort, interrupted fern, and lady fern (*Athyrium filix-femina*). Springs, seeps, and a feeder stream occur within the primary site and feed into the Blue River. The Blue River flows through the middle of the eastern unit, along with a narrow corridor of wetlands.



View from Pine Relict at Snow Bottom SNA. Photo by Ryan O'Connor.

These riparian wetlands are dominated by reed canary grass, with small pockets of lake sedge and tussock sedge. Large cottonwoods are scattered along the stream, along with brushy incursions (mostly willows and dogwoods [*Cornus* spp.]). Snow Bottom was designated a State Natural Area in 1992.

Significance of Site

Numerous high-quality Pine Relicts are found at this site. This is an extremely rare community type that only occurs within the Driftless Area. Many Midwestern endemics and habitat specialists with limited distribution occur in these settings. This site also presents an important opportunity for oak savanna restoration, another rare community type. Two rare forest interior birds that occur at this site. Three rare plants also occur here and four additional rare plants are known close-by.

Snow Bottom SNA falls within the Snow Bottom Conservation Opportunity Area (COA) as described in the Wildlife Action Plan (WDNR 2006). This COA is part of the larger Driftless Area Features Significant Ecological Feature, which promotes conservation of a continuum of Dry Prairie, Dry-Mesic Prairie, Oak Opening, Oak Woodland, Southern Dry Forest, Southern Dry-Mesic Forest, Southern Mesic Forest, Shrub Carr, Dry Cliffs, and Moist Cliffs over loess and sandstone influenced soils.

Blue River was sampled for aquatic invertebrates in 2011. One SGCN aquatic beetle was collected. Blue River is a Class II trout stream.

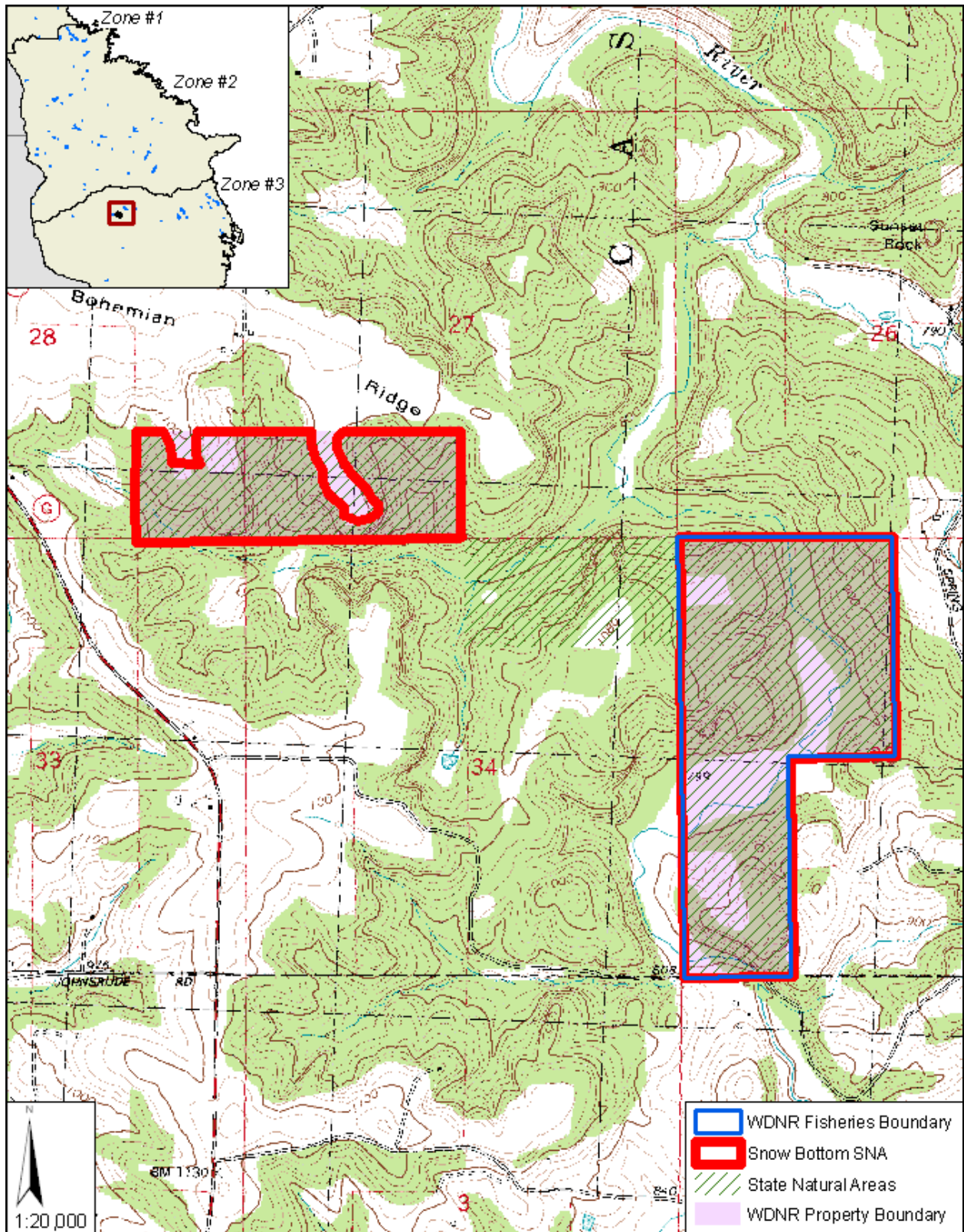
Management Considerations

Promoting and maintaining ecological reference area conditions for Pine Relict is a high priority for this site. Maintaining Southern Dry Forest and restoring Oak Woodland, a rare oak savanna type, are also important management opportunities and priorities. Rare forest interior birds and rare plants will benefit from implementation of these priority actions. Although a passive management regime is recommended for the Pine Relicts, prescribed fire and tree/brush thinning may be required in all other communities.

Diligent monitoring and control of non-native invasive plants are vital. Garlic mustard, multiflora rose (*Rosa multiflora*), common buckthorn, and reed canary grass are known here.

Blue River is rated an Exceptional Resource Water (ERW), indicating that it warrants additional protection from the effects of pollution. This designation is intended to meet federal Clean Water Act obligations.

DAS09. Snow Bottom State Natural Area Primary Site



DAS10. TROUT CREEK UPLANDS

Location

Properties:	Trout Creek Fishery Area
County:	Iowa
Landtype Association:	Hills and Valleys - Wisconsin River Drainage (222Lc18)
Approximate Size (acres):	153

Description of Site

This primary site is divided into two disjunct units; they occur on rocky, steep-sided bluffs that rise above Trout Creek. The south unit harbors a diverse habitat matrix of cliffs, Pine Relicts, Oak Barrens, Oak Woodland, and Southern Dry and Dry-mesic Forest. The Pine Relicts here are characterized by red pine and red maple growing from dolomitic sandstone outcrops and very thin soils on the adjoining bluff top. Typical ground layer species include Pennsylvania sedge, huckleberry, and Canada mayflower (*Maianthemum canadense*). The Pine Relicts transition to Oak Barrens as one moves away from the cliff edges. Canopy cover in the Oak Barrens is 50% from white and black oak, while subcanopy cover is 6-25% from white and black oak, and shrub cover is 6-25% from American hazelnut, red raspberry (*Rubus idaeus*), dwarf red raspberry (*R. pubescens*) and huckleberry. The oaks here have stunted and twisted growth forms. The barrens ground layer is moderately diverse with the most common species being Pennsylvania sedge, sand cress (*Arabis lyrata*), huckleberry, and dwarf red raspberry. The flat ridgetop of this site harbors Southern Dry Forest/Oak Woodland and is dominated by white and black oak that create 76-95% cover. As one moves into the west-facing slopes and draws, one encounters a more closed canopy forest of Southern Dry-mesic Forest; similar forest occurs on the steep east-facing slopes below the cliffs. Canopy cover here is 76-95% here from bigtooth aspen (*Populus grandidentata*), white oak, and red oak, while the shrub layer is sparse with American hazelnut and brambles (*Rubus* spp). The ground layer has moderate diversity, and is dominated by maidenhair fern, interrupted fern, spinulose wood fern (*Dryopteris carthusiana*), and wild geranium. The north unit harbors 38 acres of Southern Dry and Dry-mesic Forest on a shallow-soiled, rocky, north-facing slope with a shallow draw; its structure and composition is comparable to the same cover types described for the south unit.

Significance of Site

Small areas of fair-quality Pine Relict and Oak Barrens are found on this site, two rare community types in Wisconsin. Pine Relict is an extremely rare community type that only occurs within the Driftless Area. Many Midwestern endemics and habitat specialists with limited distribution occur in these settings. Trout Creek Uplands also harbors significant opportunities for Oak Woodland restoration. The woodlands of both units are large enough to support declining forest interior songbirds, including two state threatened species and six SGCN. A rare plant is also known from this site's cliffs and Pine Relicts.

Management Considerations

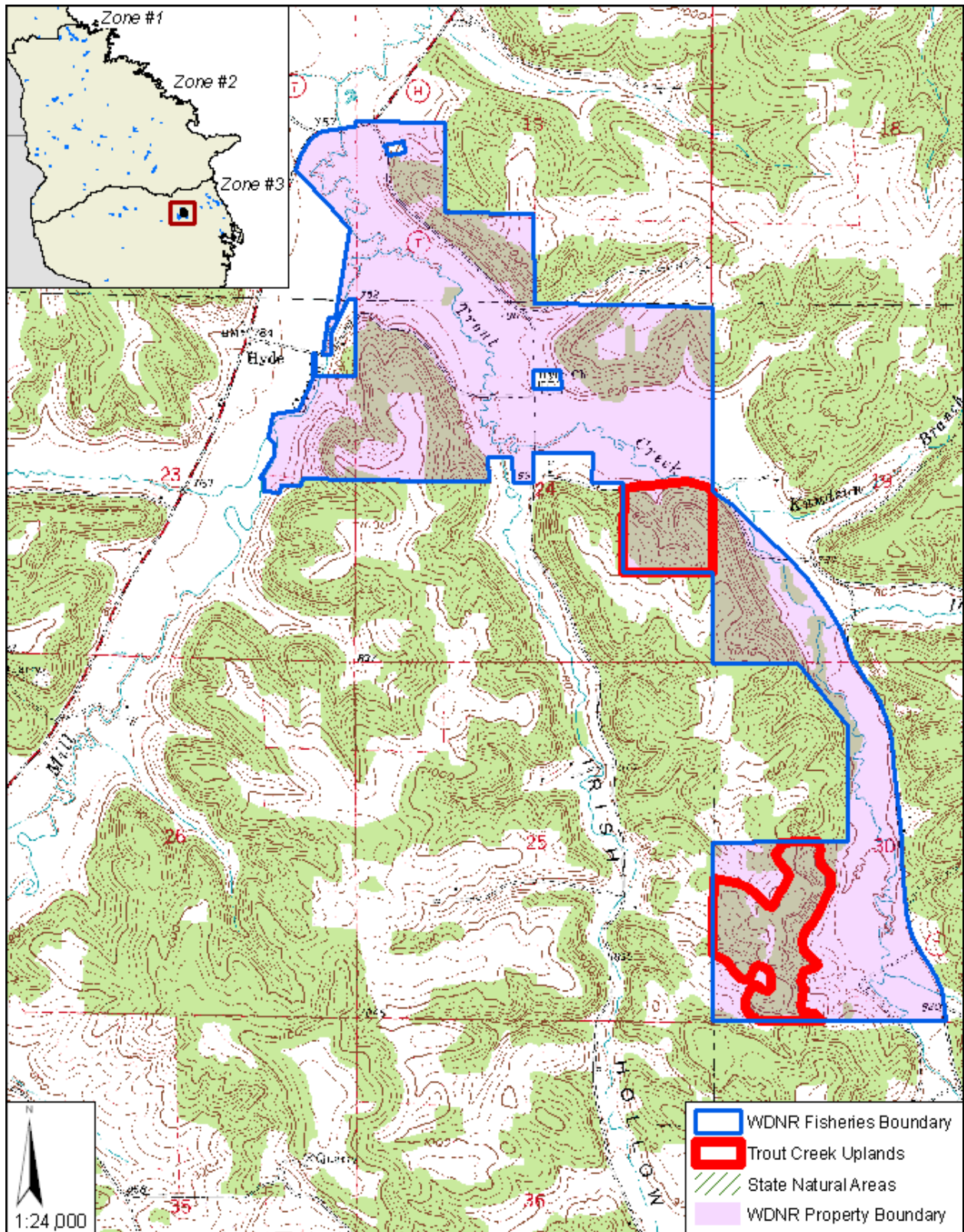
North Unit: Threats include natural succession in the absence of fire, erosion along field road, and small amounts of non-native invasive plants including multiflora rose, autumn-olive (*Elaeagnus angustifolia*), non-native bush honeysuckle, and common buckthorn. Allowing the adjoining woodland on this property to mature could provide an opportunity to expand this unit, increasing its long-term viability and habitat potential.

South Unit: In wooded areas on bluffs and steep slopes, non-native invasive plants currently pose a minor threat, and include non-native bush honeysuckle, common buckthorn, autumn-olive, multiflora rose, and garlic mustard. The threat of invasives invading from the interface between the upland primary site and the riparian wetlands is enormous; all of the above species are abundant there, in addition to Japanese hedge-parsley (*Torilis japonica*) and oriental bittersweet (*Celastrus orbiculatus*). Careful survey of high-quality areas for invasives with follow-up control and then ongoing monitoring are needed urgently. Beyond that, the main management need is prescribed fire.



Southern dry-mesic forest at Trout Creek Uplands. Photo by Amy Staffen.

DAS10. Trout Creek Uplands Primary Site



DAS11. PINNACLE ROCK REARING STATION

Location

Properties:	Pinnacle Rock Fishery Area, Pinnacle Rock Rearing Station
County:	Monroe
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16)
Approximate Size (acres):	48

Description of Site

Pinnacle Rock and Pond are found on this site along an unnamed Class I trout stream. Very steep north-, northeast- and west-facing forested slopes, along with a rock outcrop, are clad with dry-mesic forest. The forest east of the pond has 80% canopy cover from red/white oak (25-30 inches dbh), aspen and paper birch (18-20 inches dbh), and a fair number of Norway spruce (*Picea abies*; 20 inches dbh). The subcanopy creates 50% cover here, and is composed of paper birch, hickory, American elm, and basswood saplings/poles. Dominant shrubs are brambles, currants (*Ribes* spp.), prickly-ash and dogwood. On the south-facing slope adjacent to Pinnacle Rock itself is a remnant prairie approximately half an acre in size. Although sumac (*Rhus glabra*) and other shrubs are encroaching, Dry Prairie indicators such as prairie dropseed (*Sporobolus heterolepis*), lead-plant (*Amorpha canescens*), and blue-eyed grass (*Sisyrinchium campestre*) persist. The forest west of the pond is also dry-mesic but of higher quality than the forest east of the pond. Here, 80-90% canopy cover is created by red/white oak (19-29 inches dbh), red/sugar maple (14-24 inches dbh) and paper birch, along with 10-15% subcanopy cover from American elm, maple and hickory. The dominant shrub is hazelnut (*Corylus americana*) and the herbaceous ground layer is dominated by spring ephemerals, as well as some orchids and pteridophytes. A moderate draw, rock outcrops and boulders are interesting features here.

Significance of Site

Good-quality Southern Dry-mesic Forest is uncommon in Wisconsin. The mature forest west of the pond supports a rare forest interior bird species. Another SGCN bird uses the earlier successional habitat east of the pond. A special concern rare plant is found in the dry-mesic forest west of the pond.

Pinnacle Rock Rearing Station was sampled at two locations for aquatic invertebrates in 2011. The water quality is excellent and aquatic macrophytes (plants) are dense, creating a "fabulous" environment for at least 33 aquatic invertebrate species, including two Special Concern and two SGCN.

Management Considerations

The unnamed creek that flows through this site (WBIC 1658000) is rated an Exceptional Resource Water (ERW), indicating that it warrants additional protection from the effects of pollution. This designation is intended to meet federal Clean Water Act obligations. Maintenance of diverse and intact upland communities within the primary site will help to maintain the high-quality aquatic resources associated with them.

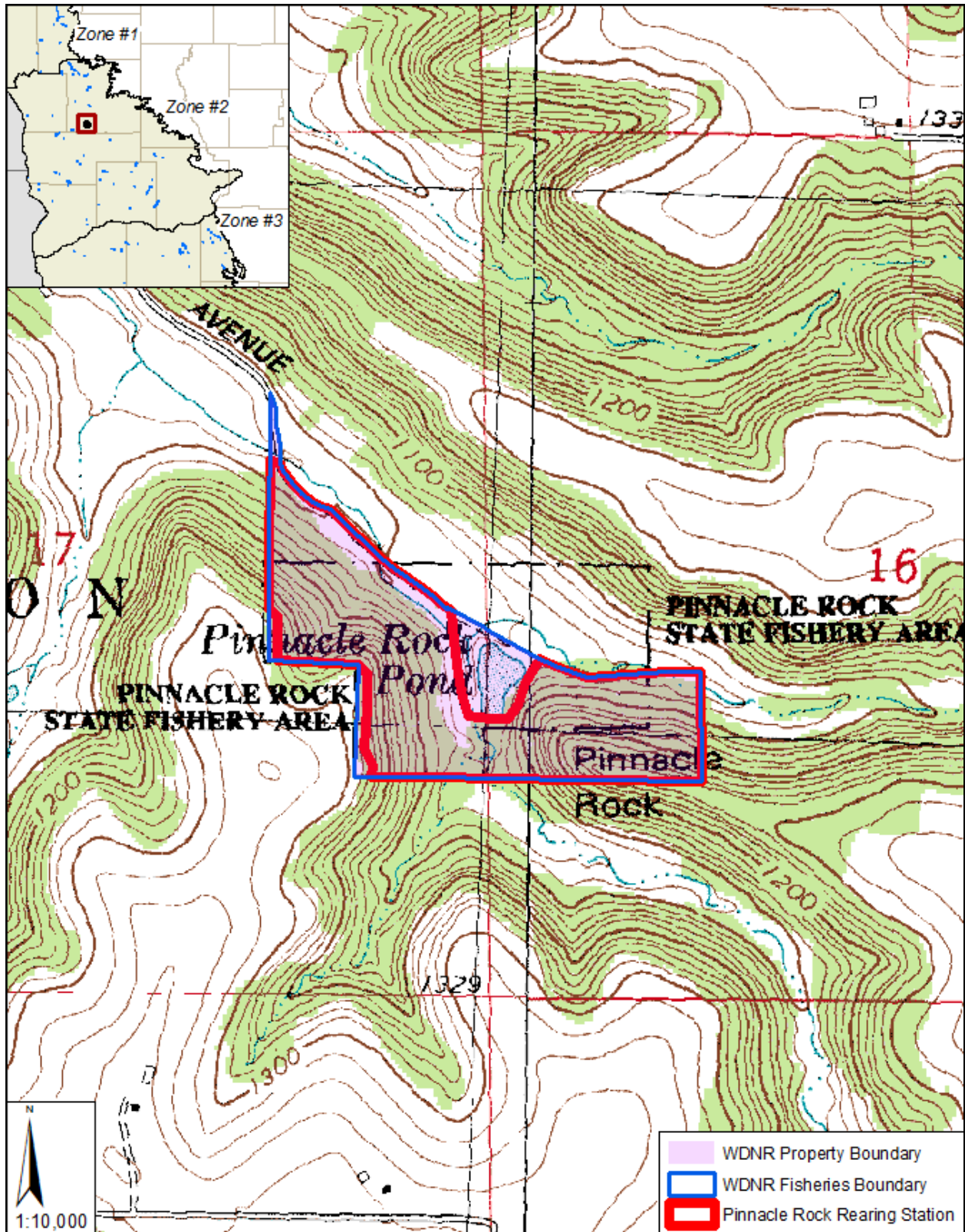
Control of non-native invasive species is a priority for this site. West of the pond, there are moderate amounts of mature non-native bush honeysuckle and common buckthorn (mostly seedlings, but a few small, reproducing adults). East of the pond, there is just a small amount of common buckthorn, mostly on the west-facing slope. Although few non-native invasives were observed in the higher quality

communities, large patches of garlic mustard and dame's rocket (*Hesperis matronalis*) occur along the adjacent roadside, posing a significant threat to the site.



NHI Botanist Kevin Doyle surveys Southern Dry-mesic Forest at Pinnacle Rock Rearing Station. Photo by Ryan O'Connor.

DAS11. Pinnacle Rock Rearing Station Primary Site



DAS12. MILANCTHON CREEK

Location

Properties:	REM-Milancthon Creek
County:	Richland
Landtype Association:	LeFarge Hills and Valleys (222Ld02)
Approximate Size (acres):	48

Description of Site

This site harbors a good-quality, uneven-aged stand of Southern Dry-mesic to Mesic Forest on steep north- and west-facing slopes with high canopy cover from sawtimber-sized (>11" diameter) red oak and lesser amounts of sugar maple and big-toothed aspen. Significant downed woody debris is present. The ground layer is typified by wood anemone (*Anemone quinquefolia*), American cancer root (*Conopholis americana*), bloodroot (*Sanguinaria canadensis*), blue cohosh (*Caulophyllum thalictroides*), wild geranium, and maidenhair fern.

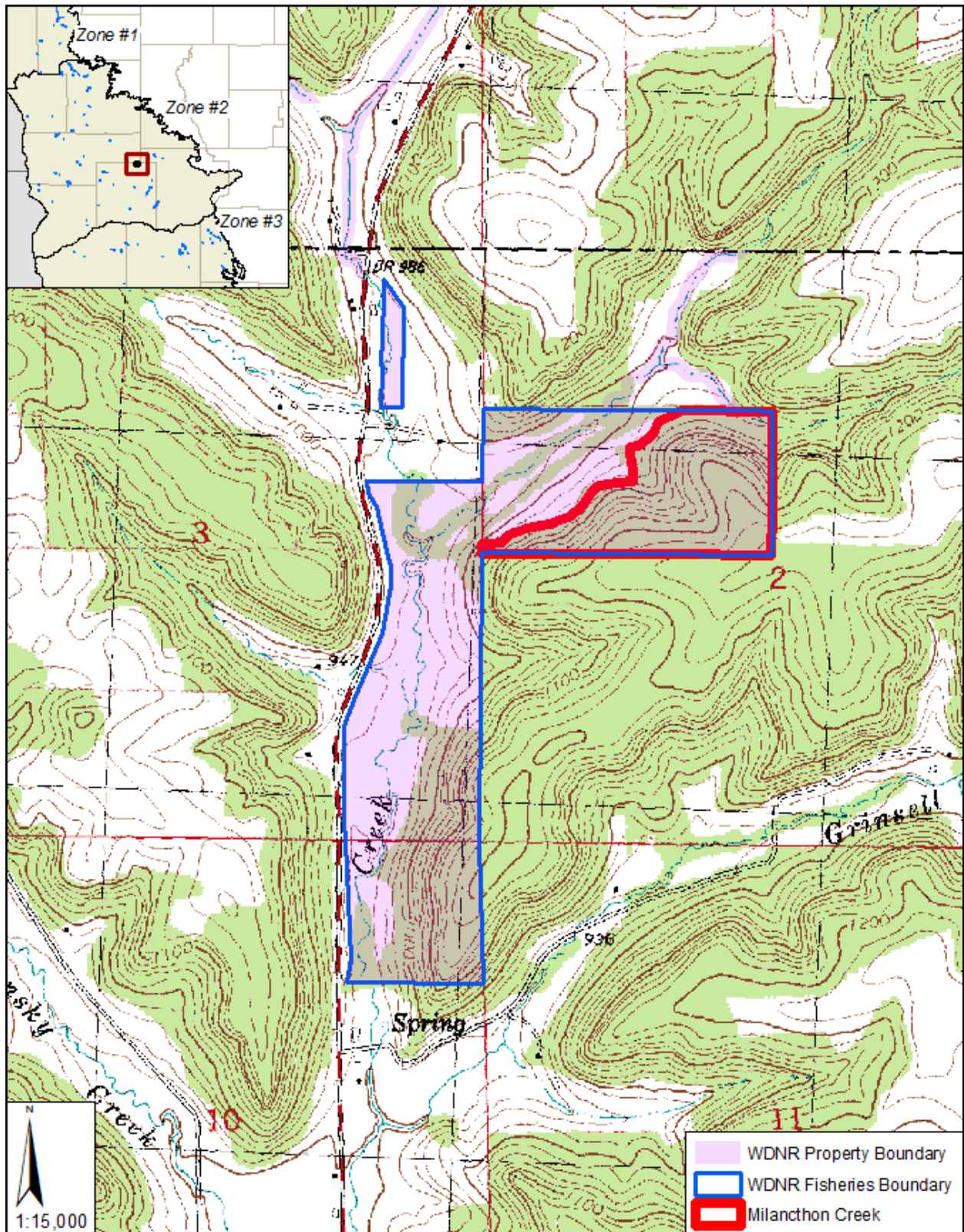
Significance of Site

Good-quality Southern Mesic Forest is rare in Wisconsin. This site supports one rare forest interior bird and has the potential for others. It also holds potential to support rare terrestrial snails: two rare species, were found on the property southwest of the primary site. This forest is highly unusual in that no non-native invasive plants were noted here.

Management Considerations

Promoting and maintaining conditions for mature Southern Dry-Mesic and Mesic Forest, and maintaining habitat for forest interior birds, are high priorities for this site. Rare terrestrial snails and plants will benefit from implementation of these management targets. Diligent monitoring and control of non-native invasive plants are vital activities for this site. Terrestrial snail surveys should be conducted on this primary site, due to the discovery of rare snails on a proximal parcel in similar habitat.

DAS12. Milanathon Creek Primary Site



DAS13. BIG SPRING CREEK

Location

Properties:	Big Spring Fishery Area
County:	Iowa
Landtype Association:	Hills and Valleys - Wisconsin River Drainage (222Lc18)
Approximate Size (acres):	39

Description of Site

A small but good-quality Oak Woodland on south- and southwest-facing slopes is dominated by 24-28-inch dbh red oak, bur oak, white oak, and black oak, often with savanna limb architecture. The subcanopy is composed of red maple, shagbark hickory, yellowbud hickory, American elm, hop-hornbeam, and bigtooth aspen. Common ground layer species include arrow-leaved aster (*Aster sagittifolius*), wild geranium, eastern star sedge (*Carex radiata*), white avens (*Geum canadense*), and Virginia creeper (*Parthenocissus quinquefolia*). A unique geological feature of the site is Big Spring, aptly named with a flow of hundreds of gallons per minute. The spring is located mid-slope on a south-facing, forested hillside, and feeds the cool-water Big Spring Branch below.

Significance of Site

This site presents an important opportunity to restore Oak Woodland, a rare savanna type in Wisconsin. The cliff and oak savanna areas of this site provide important habitat for snakes, including some that are rare. Habitat degradation in the form of woody plant invasion threatens these rare reptiles by eliminating open habitat areas needed for thermoregulation and female gestation.

The spring and creek were sampled for aquatic invertebrates in 2011 and were found to have excellent water quality. Two State Special Concern species and one SGCN were collected.

Management Considerations

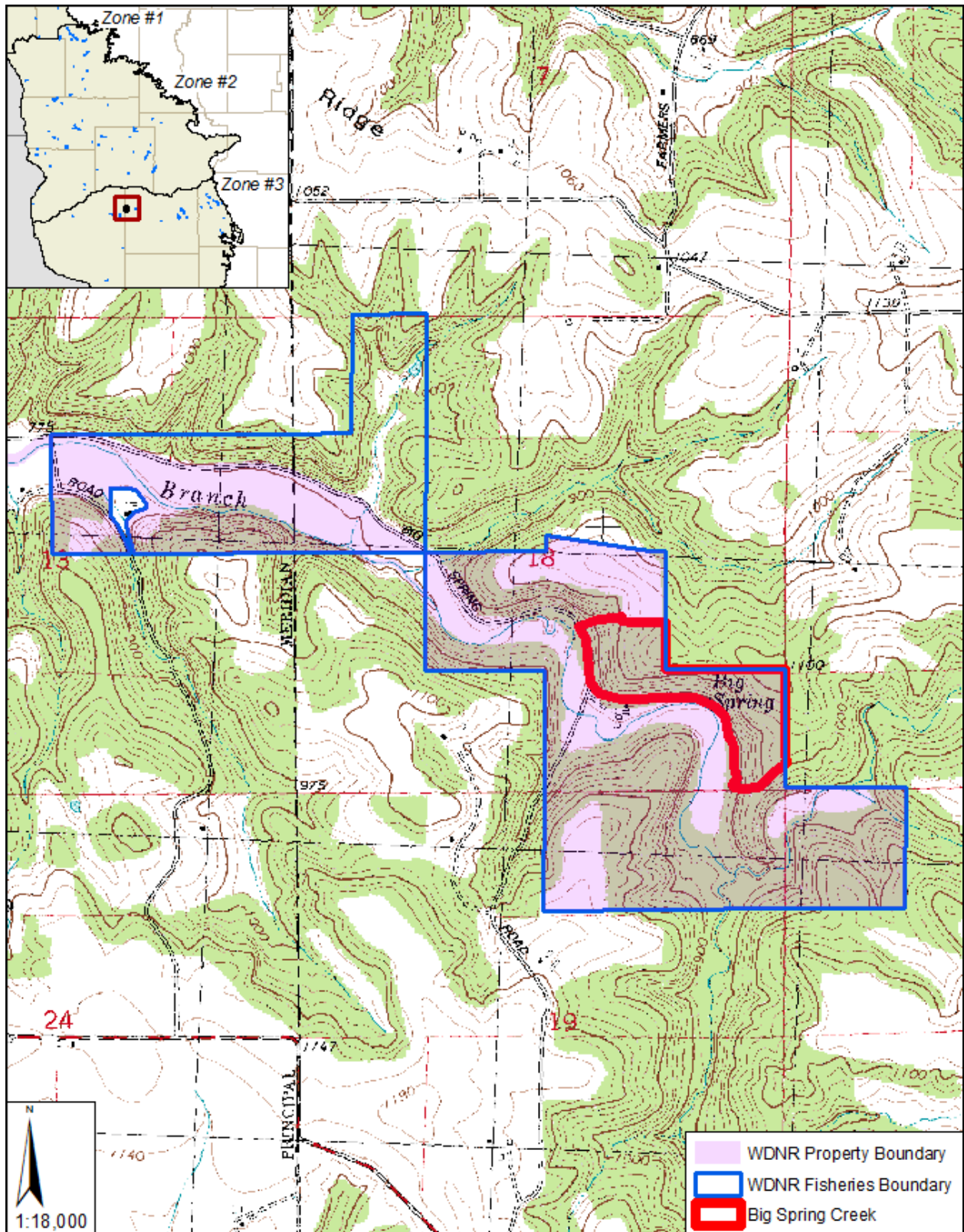
Restoring and maintaining oak savanna habitat is a high priority for this site. Such activities would directly benefit many plants and animals that rely on this type of habitat, especially rare snakes. Diligent monitoring and control of non-native invasive plants are vital activities here. Garlic mustard and multiflora rose are present but sparse.

Protecting the spring and creek is also a high priority for this site. Limitation of nonpoint pollution runoff, groundwater withdrawal, and extensive timber harvests, along with restoration of native plant cover at and around the springs, will help protect the spring (WDNR in prep.) and maintain water quality of the creek.



Big Spring. Photo by Ryan O'Connor.

DAS13. Big Spring Creek Primary Site



DAS14. TAINTER CREEK

Location

Properties:	LaCrosse River Comprehensive Fishery Area – Tainter Creek
County:	Vernon
Landtype Association:	Rountree Ridges, Tunnel City Hills, and Valleys-South (222Lc16)
Approximate Size (acres):	121

Description of Site

This site features high-quality Southern Mesic Forest on north- and northeast-facing slopes, a series of moist northeast-facing sandstone cliffs, and moderate-quality Southern Dry-mesic Forest/Oak Woodland on the ridgetops and southwest-facing slopes. Two stands of high-quality mesic forest are dominated by 18- to 30-inch dbh basswood, sugar maple and red oak, with subdominant trees of yellow birch (*Betula alleghaniensis*), American elm, yellowbud hickory, and white ash. The subcanopy is occupied by hop-hornbeam, nannyberry and alternate-leaved dogwood (*Cornus alternifolia*), along with numerous maple saplings. Mountain maple (*Acer spicatum*) occurs in areas of moist moss-covered talus. Shrubs/small trees include bladdernut (*Staphylea trifoliata*), musclewood (*Carpinus caroliniana*), eastern leatherwood, eastern wahoo (*Euonymus atropurpurea*), and American hazelnut. The mesic ground layer is extremely diverse, with species such as showy orchis (*Galearis spectabilis*), blue cohosh, large-flowered bellwort, and Dutchman's breeches. The Southern Dry-mesic Forests are dominated by 14- to 18-inch dbh red, white and bur oak; together, these create 80% canopy cover.

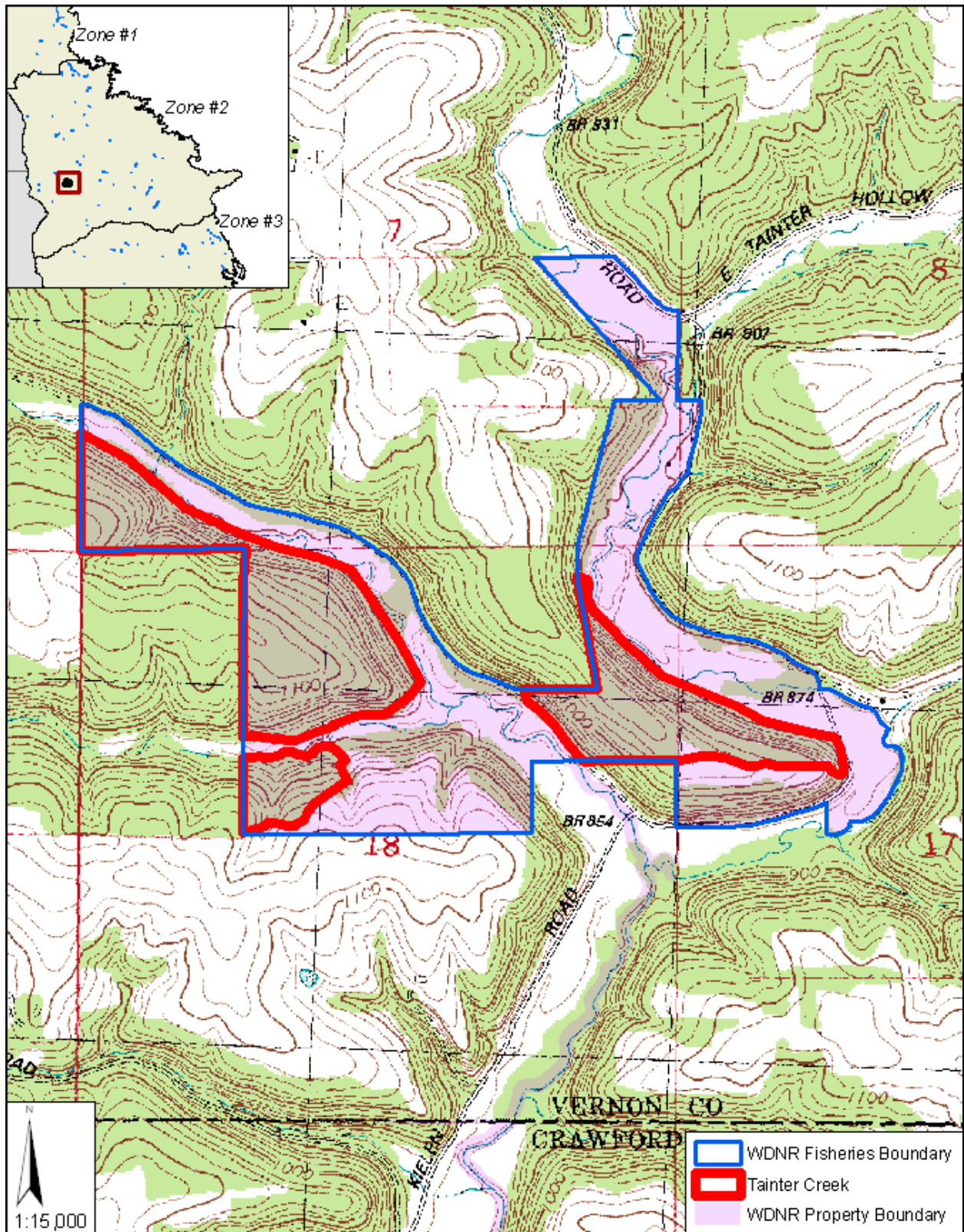
Significance of Site

This site harbors high-quality Southern Mesic Forest, a rare feature in the state. Three rare forest interior birds and a rare snail are found here, and there is potential for rare herptiles to utilize the upland forest for foraging during summer months, along with the adjacent stream and riparian habitat outside of the primary site. Two rare plants are also found here.

Management Considerations

Promoting and maintaining ecological reference area conditions for Southern Mesic Forest and maintaining habitat for forest interior birds are high priorities for this site. Rare terrestrial snails, plants, and herptiles will benefit from implementation of these management targets. Diligent monitoring and control of non-native invasive plants are vital. Garlic mustard occurs in adjacent areas.

DAS14. Tainter Creek Primary Site



DAS15. RUSH RIVER DELTA STATE NATURAL AREA

Location

Properties:	Rush River Fishery Area, Rush River Delta State Natural Area
County:	Pierce
Landtype Association:	Mississippi River Valley Train-North (222Lc08), Eroded pre-Illinoian Ground Moraines (222Lc12)
Approximate Size (acres):	340

Description of Site

Rush River Delta State Natural Area (SNA) protects a Floodplain Forest at the mouth of Rush River where it empties into the Mississippi River's Lake Pepin. This site supports mature Floodplain Forest with an uneven-aged, closed canopy that is strongly dominated by large diameter (24-inch or greater) silver maple, along with lesser amounts of cottonwood and American elm. As one moves to the south and east, the forest becomes younger, and is likely more influenced by flooding from the Mississippi River. Wet depressions are scattered throughout and are vegetated with river bulrush (*Bolboschoenus fluviatilis*) and smartweed (*Polygonum* spp.). A sand spit extends into Lake Pepin at the Rush River mouth. Rush River Delta was designated a State Natural Area in 1986.

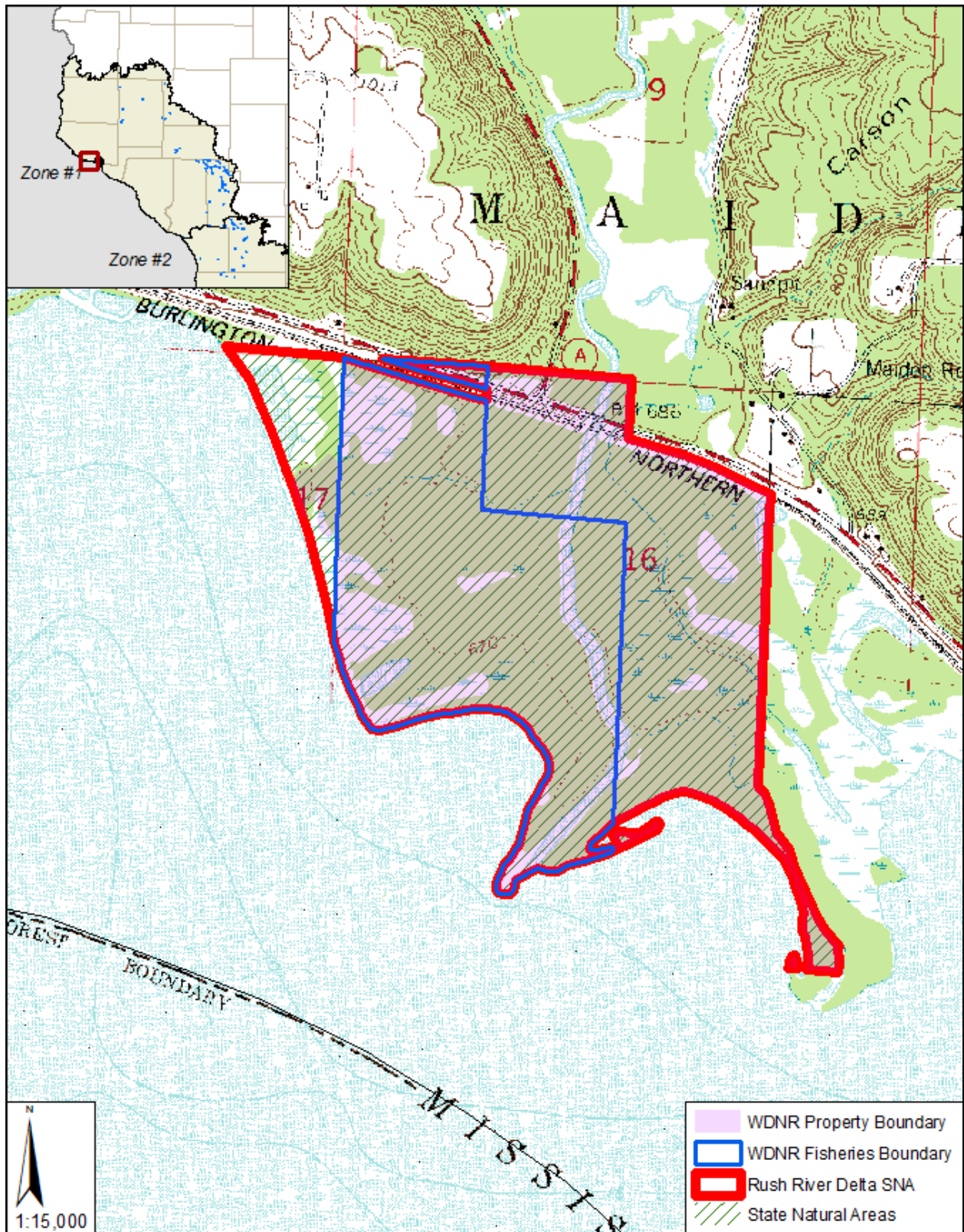
Significance of Site

The Floodplain Forest supports many breeding birds including four rare species. A small great blue heron (*Ardea herodias*) rookery was observed here in the 1980's, but no evidence of the rookery was visible during surveys in 2010. Wet depressions in the forest provide excellent spawning habitat for northern pike and rearing areas for waterfowl. Turtles have been known to use the open sand spit for nesting.

Management Considerations

Managing Rush River Delta SNA as a Floodplain Forest ecological reference area and maintaining habitat for forest interior birds and fish spawning areas are high priorities for this site. Diligent monitoring and control of non-native invasive plants are vital; moneywort and reed canary grass are known here. Removal of log jams and detritus blocking fish spawning areas can be done as necessary, although soil disturbance should be avoided. During years of sandbar exposure, entry to these areas may be restricted to protect nesting habitat for turtles.

DAS15. Rush River Delta SNA Primary Site



DAS16. HULBURT CREEK WOODS STATE NATURAL AREA

Location

Properties:	Hulburt Creek Fishery Area, Hulburt Creek Woods State Natural Area
County:	Sauk
Landtype Association:	Wisconsin Dells (222Ra02), Trempealeau Sandstone Hills (222Lb07)
Approximate Size (acres):	179

Description of Site

Hulburt Creek Woods State Natural Area (SNA) contains a diverse complex of communities along a small Class I trout stream. Hulburt Creek is a clear, cold, fast flowing stream with numerous springs and feeder streams. Sandstone cliffs with Northern and Southern Dry-mesic Forest relicts, bedrock exposures, and shaded cliffs are also present. The Southern Dry-mesic Forest is dominated by black, white, and red oaks with lesser amounts of shagbark and bitternut hickory, jack pine, red maple, paper birch, aspen and black cherry. White pine dominates the Northern Dry-mesic Forest, though there are also substantial quantities of red maple, red pine and red oak. Common ground layer plants include trailing arbutus (*Epigaea repens*), large-leaved aster (*Aster macrophyllus*), American starflower (*Trientalis borealis*), and Canada mayflower. Impressive sandstone cliffs contain numerous seeps and cold air drainages where plants with more northern affinities occur, including many ferns, liverworts, and mosses. Along the creek and its tributaries is a well-developed Alder Thicket, providing habitat for specialized cold water plants, including swamp saxifrage, marsh pennywort (*Hydrocotyle americana*), water-starwort (*Callitriche palustris*), and marsh purslane (*Ludwigia palustris*). Hulburt Creek Woods was designated a State Natural Area in 2002.

Significance of Site

The diverse complex of natural communities, many of which are high-quality, is significant. This site provides breeding habitat for three forest-interior birds and two rare plants. Hulburt Creek Fishery Area was sampled for aquatic invertebrates in 2011 and was found to have excellent water quality. A total of 31 species were collected, including two Special Concern species.

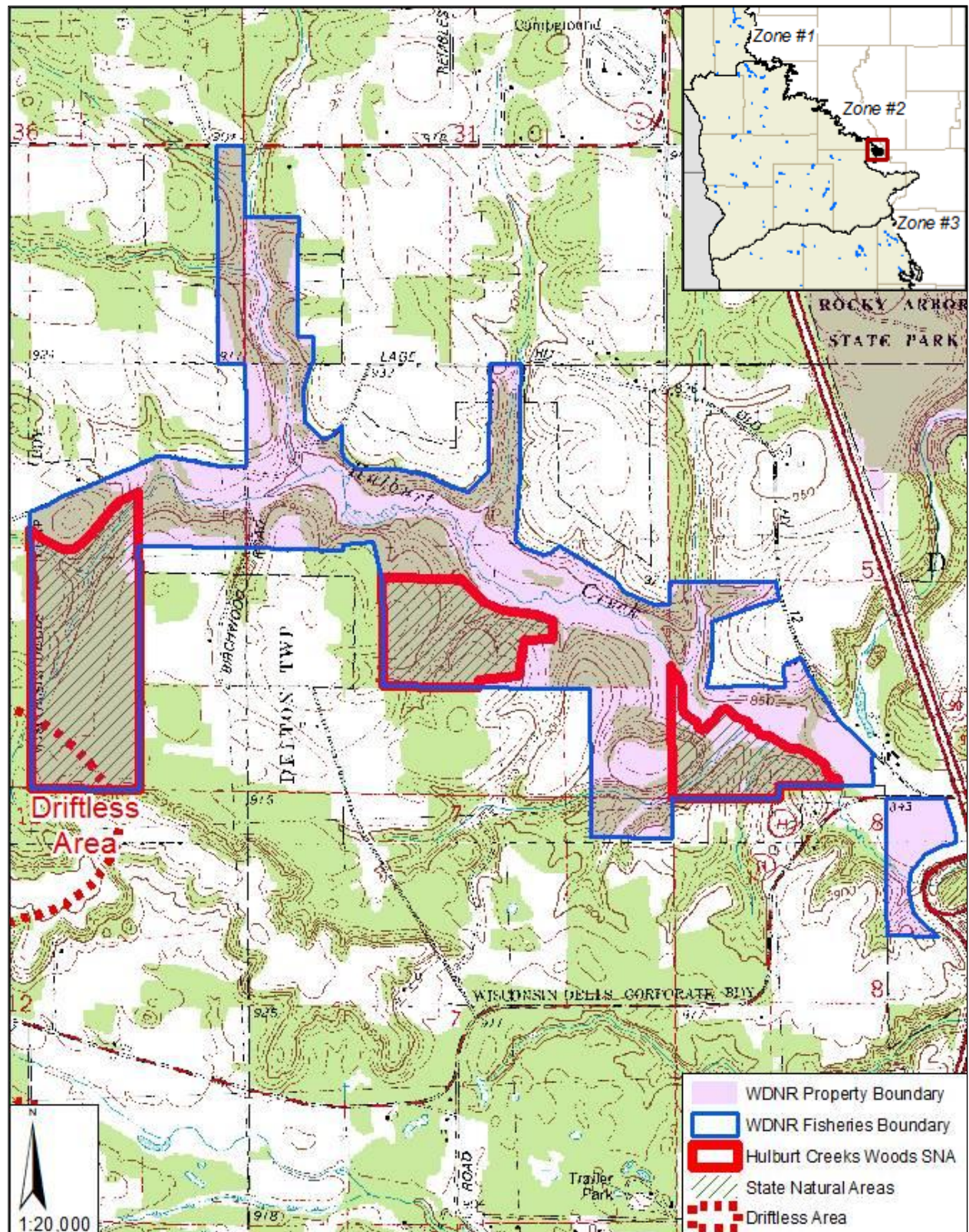
Management Considerations

Restoring and maintaining ecological reference conditions for Southern and Northern Dry-mesic Forest and Moist Cliff, protecting and maintaining habitat for forest interior birds, and protecting and maintaining high quality aquatic features, are high priorities for this site. A mainly passive management regime may be considered for the forest communities, although prescribed understory manipulation and shrub control via harvest, brushing or fire may be needed to mimic natural disturbance patterns. Surveys for non-native invasive terrestrial and aquatic plants and development of an invasive species management plan represent high-impact conservation actions.



Wood thrush. Photo by Steve Maslowski.

DAS16. Hulburt Creek Woods SNA Primary Site



DAS17. BUFFALO RIVER TRAIL PRAIRIES STATE NATURAL AREA

Location

Properties:	Buffalo River Fishery Area, Buffalo River Trail Prairies SNA, Buffalo River State Trail
County:	Buffalo, Trempealeau, Jackson
Landtype Association:	Boone Valleys and Hills (222Lb05)
Approximate Size (acres):	152

Description of Site

Buffalo River Trail Prairies State Natural Area (SNA) contains four high quality Dry-mesic Prairie remnants on sandy soils along the Buffalo River State Trail. The four prairie remnants stretch between Eleva and Osseo. One is located west of Eleva, two are found east of Strum, and the largest occurs along a five-mile stretch of trail east of Osseo. The prairies contain numerous species with grasses including big and little bluestem and Indian grass. Showy forbs include stiff goldenrod (*Solidago rigida*), prairie tickseed (*Coreopsis palmata*), spiderwort (*Tradescantia ohiensis*), and flowering spurge (*Euphorbia corollata*). Buffalo River Trail Prairies was designated a State Natural Area in 2002.

Significance of Site

Prairies once dominated the Midwestern landscape, but now rank among the most threatened habitats in the world. Wisconsin's prairies are home to more than 400 species of plants and animals, many of which are restricted to remnant prairie habitats, thus many are very rare.

This site is important to bats, especially for foraging opportunities. Two rare bat species were recorded here during acoustic surveys in 2011. The site also provides habitat for small mammals, including a species concern species as well as other more common species such as the masked shrew, meadow vole, prairie deer mouse (*Peromyscus maniculatus bairdii*), and pocket gopher (*Geomys bursarius*).

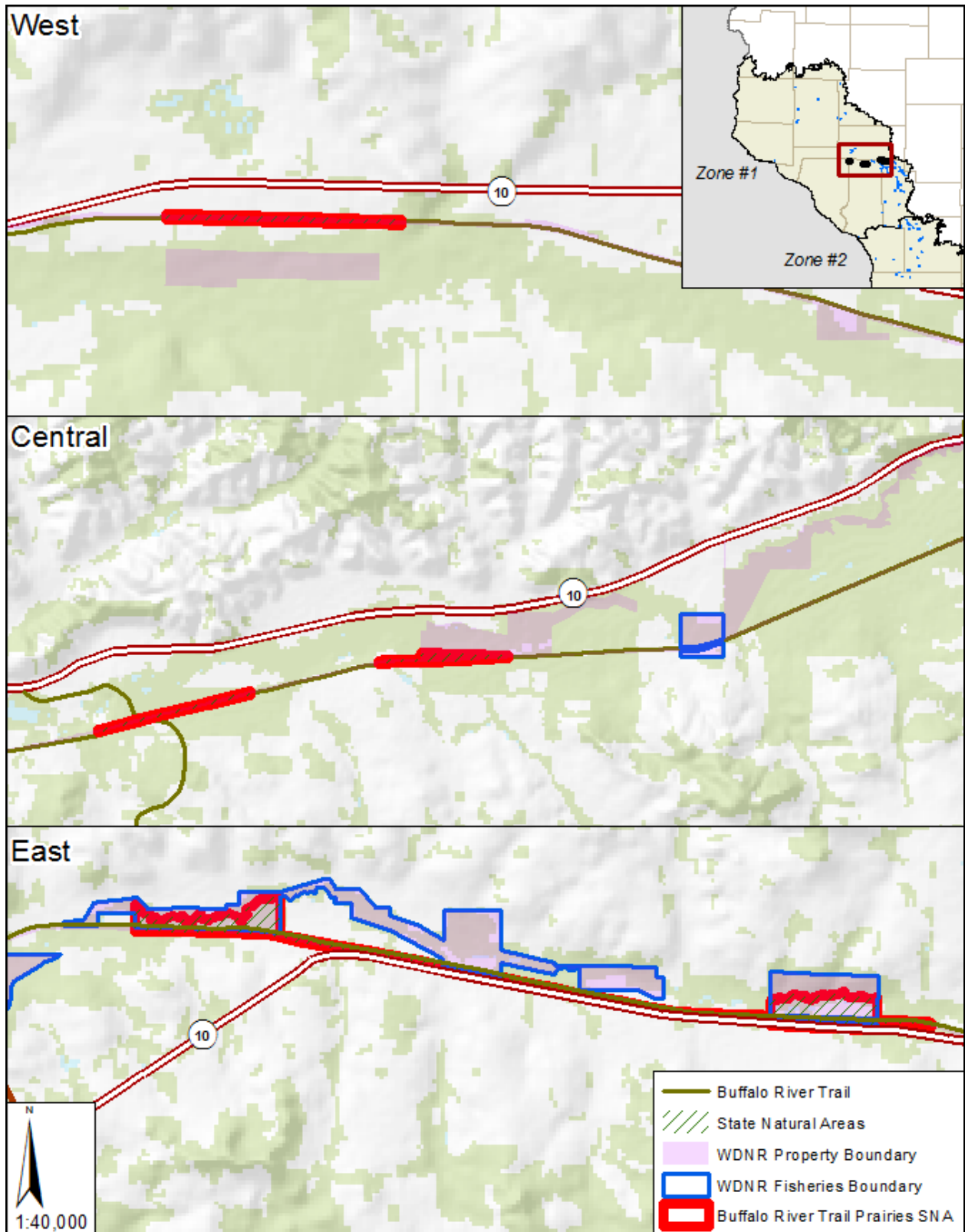
Maintenance of high-quality native terrestrial and riparian communities will help maintain high water quality in the river and thus benefit the rare invertebrates that live there. The Buffalo River Fishery Area was sampled for aquatic invertebrates at 6 locations in 2011, and one location within this primary site. The section of river within the primary site had excellent water quality. Thirty-four species were collected, including one Special Concern species and three SGCN.

Management Considerations

Restoring and maintaining ecological reference conditions for Dry-mesic Prairie and protecting high-quality aquatic features are high priorities for this site. For the prairie, this may require an intensive prescribed fire management program, along with tree/shrub control using tree harvest and brushing. Surveys for non-native invasive terrestrial and aquatic plants and development of an invasive species management plan represent high-impact conservation actions.

It is recommended that riparian wetlands within adjoining Fishery Area lands be managed in a similar manner to that of the primary site, i.e., promote growth of diverse native vegetation. This will not only provide a buffer area for the high-quality prairie of the primary site but will also expand and improve habitat for small mammals that utilize open grasslands and wetlands and will maintain and improve river conditions for diverse aquatic invertebrates.

DAS17. Buffalo River Trail Prairies SNA Primary Site



Appendix H

Rare Species and High Quality Natural Communities of Driftless Area Study Streams Primary Sites

This table shows the rare species and high-quality natural communities currently known from Driftless Area Study Streams listed by Primary Site. For sites that include State Natural Areas, the primary site boundary may go beyond that of the Driftless Area Study Streams study area. For this reason, there may be species or natural communities that appear in this table that do not appear in tables elsewhere in the report. For an explanation of state and global ranks, as well as state status, see Appendix A. State status, tracking status, and ranks are based on the working list published June 1, 2011. Species with a “W” in the “Tracked by NHI” column are on the Watch List (see Appendix F) and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list.

THIS INFORMATION
NOT AVAILABLE TO PUBLIC
DUE TO SENSITIVE
LOCATIONAL INFORMATION
ON RARE SPECIES

Appendix I

State Natural Areas that have no fisheries-owned parcels, but fall within the Driftless Area and are associated with streams

These State Natural Area (SNA) sites are logical inclusions for this master planning initiative and are described here mainly to provide a place-holder for their inclusion in the Driftless Area Study Streams master planning process. Information was copied directly from the WDNR State Natural Area webpages.

Ridgeway Pine Relict State Natural Area

Description

Ridgeway Pine Relict features a spectacular site with eight separate pine relicts set among soaring sandstone cliffs, numerous rock outcrops, shallow caves and rockshelters. Pine relicts are southern Wisconsin pine forests that have persisted since the last glacier receded some 12,000 years ago when a cooler climate was favorable for the growth of pine forests. As the climate warmed prairie and oak woodlands replaced the pine and today, remnant pine forests remain only on steep slopes and rocky cliffs in the Driftless Area. These rocky outcrops protected the pine remnants from fire and allowed the pines to reach old-growth status. Within the pine relict areas, white pine is generally more abundant than red pine, but there is good reproduction of both species. Jack pine is also present. Sugar maple, mountain maple, yellow birch, and hemlock constitute a smaller component. The ground flora includes pipsissewa, shin-leaf, wintergreen, huckleberry, and Canada mayflower. There is also a high diversity of ferns present. Between the relicts and surrounding them is forested land dominated by white oak with bur and red oak, black cherry, white birch, and shagbark and bitternut hickory. Other significant features include sandstone cliffs with shaded and open plant communities, diverse spring runs, sedge meadows, and dry-mesic prairie. Ridgeway Pine Relict was designated a State Natural Area in 1998.

Site Objectives

Manage the site as a reserve for pine relict and shaded cliff, as an oak savanna and prairie restoration site, and as an ecological reference area. Natural processes will determine the structure of the pine relict. Natural processes and prescribed fire will determine the structure of the remainder of the site's natural communities. Provide opportunities for research and education on the highest quality native pine relicts.

Management Approach

The native dominant pine relict tree species (primarily white pine) are managed passively and will gradually convert over time to a more mesic forest condition. The native dominant savanna tree species (primarily oaks) form the basis for an oak savanna restoration, along with the old field, which can be restored to mesic prairie. Some thinning of the canopy, understory manipulation and shrub control via harvest, brushing or fire may be needed to mimic natural disturbance patterns. Augmentation of the ground layer will only add species that historically would have been found on the site, using seeds or plugs from local genetic material; this usually occurs in the early stages of restoration. Other allowable activities throughout the site include control of invasive plants and animals, augmentation of native prairie species after careful review, maintenance of existing facilities, and access to suppress wildfires. Salvage of trees after a major wind event can occur if the volume of woody material inhibits fire prescriptions.

Pecatonica River Woods State Natural Area

Description

Pecatonica River Woods features a mosaic of natural community types including southern dry, dry-mesic, and mesic forest; floodplain forest; and a three-quarter mile segment of the Pecatonica River. The most significant feature of the site is the one of the only known Wisconsin population of a state-endangered wildflower. Also present are populations of four other rare plants. Other plants include Short's aster, great waterleaf, toothed cress, and grass sedge. A three-quarter mile stretch of the Pecatonica River flows through the site flanked by floodplain forest of silver maple and ash. To the east is a hillside with second-growth dry to mesic forest with white oak near the ridgetop and red oak, black cherry, black walnut, and sugar maple sloping down to the river. Pecatonica River Woods is owned by the DNR and was designated a State Natural Area in 1992.

Site Objectives

Manage the site as a southern dry/dry-mesic forest and floodplain forest reserve, as an aquatic reserve, and as an ecological reference area. Natural processes will determine the structure of the forest, in addition to prescribed understory manipulation for the upland forest.

Management Approach

In the dry and dry-mesic forest, the native dominant tree species (primarily oaks) are managed passively, but understory manipulation and shrub control via harvest, brushing or fire may be needed to mimic natural disturbance patterns. The mostly passive canopy management and understory manipulation will determine the ecological characteristics of the upland forests. In the floodplain forest, native species are managed passively, allowing nature to determine their ecological characteristics. Across the entire site, allowable activities include control of invasive plants and animals, maintenance of existing facilities, and access to suppress fires. Salvage of trees after a major wind event is not considered compatible with management objectives.

Sugar River Wetlands State Natural Area

Description

Sugar River Wetlands features a diverse wetland complex including sedge meadow, calcareous fen, emergent aquatic, shrub-carr, and wet-mesic prairie. Located within the Upper Sugar River Watershed, this extensive wetland harbors numerous rare plant and animal species and contains the most diverse fishery in southern Wisconsin. The fen flora is diverse with many calcium-loving plants including Kalm's lobelia, grass-of-parnassus, and shrubby cinquefoil. The carbonate-rich groundwater that percolates up from the underlying bedrock provides high quality water to the surrounding wetlands and river. Intergrading with the fen is a wet-mesic prairie dominated by tall grasses including big blue-stem, Canada blue-joint grass, prairie cord grass, and Canada wild rye. The forb component is diverse with azure aster, shooting star, prairie blazing-star, prairie phlox, and culver's root. Also present is a southern sedge meadow with tussock sedge and a shrub-carr community dominated by tall shrubs such as red-osier dogwood, meadowsweet, and willows. Within these communities are a number of rare plants. Short-eared owls (*Asio flammeus*) frequent this area in winter and northern harriers (*Circus cyaneus*) nest within adjacent wetlands. The area is part of a larger grassland habitat restoration complex along the Sugar River, which seeks to establish landscape management areas for the benefit of declining grassland birds and animals, vegetation communities, and invertebrates that depend upon native vegetation. Sugar River Wetlands is owned by the DNR and was designated a State Natural Area in 1996.

Site Objectives

Manage the site as a restoration location for wet-mesic prairie, sedge meadow and calcareous fen, and as an aquatic preserve and wetland protection site. Natural processes and prescribed fire will determine the structure of the wetland communities. Provide opportunities for research and education on native wetland restorations.

Management Approach

The ecological characteristics of the site will be primarily restored by an intensive fire management program and a prairie seed planting program. The native wetland species are managed actively through tree/shrub control using tree harvest, brushing and especially fire to mimic natural disturbance patterns. Occasional fire-tolerant oaks and native shrubs such as white meadowsweet may be retained at low densities. Other allowable activities include control of invasive plants and animals, augmentation of native prairie species after careful review, maintenance of existing facilities, and access to suppress wildfires.

Trempealeau River Meadow State Natural Area

Description

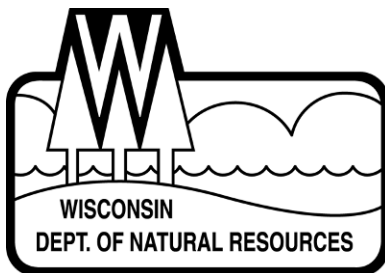
Trempealeau River Meadow is a high-quality wetland complex located in the Driftless Area of Wisconsin. The site features a large undisturbed sedge meadow with a diversity of species. Dominant plant species are tussock sedge, fox sedge, blue-joint grass, cord grass, fowl manna grass, and rice cut grass. Forbs include Canada anemone, marsh pea, panicled aster, swamp milkweed, spotted joe-pye weed, American water-horehound, and blunt-leaf bedstraw. Adjacent to the meadow is a shallow marsh with numerous emergent aquatics such as cat-tails, river bulrush, common rush, wool-grass, common bur-reed, swamp loosestrife, bulbet water-hemlock, wild rice, and broad-leaved arrowhead. At four locations the water deepens in old oxbows of the Trempealeau River forming deep-water marshes with an abundance of submerged aquatic species. An important aspect of these communities is the absence of invasive species. Large numbers of grassland birds, which are declining in Wisconsin, nest in the area. Species include bobolink, savanna sparrow, sedge wren, and several rare species. Additional rare birds of marshes also occur here. Trempealeau River Meadow is owned by the DNR and was designated a State Natural Area in 2002.

Site Objectives

Manage the site as a reserve for southern sedge meadow, wet prairie and floodplain forest, as an aquatic reserve and wetland protection site, and as an ecological reference area. Natural processes will determine the structure of the natural communities, along with prescribed vegetation management in the sedge meadow and prairie. Provide opportunities for research and education on the highest quality native wetland communities.

Management Approach

The ecological characteristics of the site will be primarily shaped by an intensive fire management program. The native sedge meadow and prairie species are managed actively through tree/shrub control using tree harvest, brushing and especially fire to mimic natural disturbance patterns. Occasional fire-tolerant trees and shrubs may be retained at low densities. Other allowable activities include control of invasive plants and animals, augmentation of native prairie species after careful review, maintenance of existing facilities, and access to suppress wildfires.



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